COAL AGE

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HALTING conservatism is the keynote of our mining methods. We have been afraid to blaze a brand new trail, and we tinker along, modifying old contrivances. No other nation adheres so dutifully in mining to antiquated principles and first ideas.

Make no question, the man who will succeed will think a new thought, or, at the very least, will *take up* with a new one. There are minds aplenty which follow, but few that lead. The masses who march in the ranks have already worked out all the possibilities of initial methods.

How ineffectual is all our mining machinery, how ineffective our shooting, how difficult the introduction of loading machines, face conveyors and pneumatic tubes with such disjointed room-and-pillar systems as we persistently follow. Waste of coal, waste of labor, poor product, low output, all are the net results of present-day conservatism.

At any colliery where coke is made, a small proportion of the overs could be harnessed to a boiler plant. One oven will supply an average of 20 h.p. every day in the week. Not only will the operator find the first cost of the installation about the same, but he will discover that the coke is brighter, denser and heavier from the process.

The recovery of tar and ammonium sulphate by the use of byproduct ovens, and the utilization of waste gas, would pay interest on the total installation charges, and in addition, would cover the cost of coal, leaving the coke as velvet.

The gas producer at first seemed but the vain dream of enthusiasts, and many persons believed it could never be set at work on dollar coal or ten-cent slack. But European colliery managers proved beyond doubt the practicability and success of the system.

It's a fact therefore today, that many of us advocate the installation of producers so as to make it possible to use fuel which can't be employed under a boiler, or to burn a better grade with increased economy. One ton of coal will turn more wheels operating through a producer and gas engine than 2½ times as much of the same fuel with a boiler and steam reciprocator of normal type.

One ton of low-grade lignite from the Dakotas will give better results by the all-gas route than a ton of the best West Virginia product used in the stereotyped fashion. No coal is too poor for producer gas, and fuel containing 70 per cent. ash has been utilized. In England, carbonaceous shales and belt pickings are added to increase the heat value and to augment the sulphate output.

Our action with regard to turbines has been the same. We needed greater power, so we put in more reciprocators and had to install additional boilers and employ more men to maneuver the shovel. If we had acted in accord with advanced ideas, we could have obtained all the power needed, by using a low-pressure turbine to take care of the exhaust steam.

Many of the new steam-electric plants are reciprocator-driven, direct-current installations, ignoring the fact that reciprocators are less efficient and that the transmission of direct current is expensive.

A new era approaches. It is unreasonable that coal companies should be compelled to waste all the gas generated, because of hobbling charters which permit them only to market coal and coke. Collieries will not always ship their output to market, but will deliver gas or electric current, and we may yet see a large yield of ammonium sulphate made possible by the use of offal and the waste of sludge tanks and cesspools.

Even now, a ton of bituminous coal in a producer will give 85 lb. of sulphate, worth, say $2.64. One hundred-weight of sulphate is used to fertilize an acre. It is evident therefore, that a good sale can be obtained for the product. The tar can be used for briquetting; so that, over and above the 140 to 160 thousand cu.ft. of gas, a considerable profit remains.

The coal industry has only just begun. Before the century is over we may extract gas from the fuel deposits without mining, or we may consume the coal as an electrical anode in a giant battery cell.

Extensive Use of Coke-Oven Gas

By C. A. Tupper*

The use of coke-oven gas in combustion engines for the generation of power has rapidly developed until now a great number of large plants of this kind are in successful operation. These are found chiefly in Germany. There are many opportunities in this country for taking advantage of German experience and converting the waste gases of coke ovens into electric power and other valuable products.

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In a recent issue of COAL AGE, I mentioned some of the possibilities of generating electric power from coke-oven gas, and described a plant typical of a number that I inspected during a tour of the coal-mining and coking districts of Europe. The plant referred to was that of the Gewerkschaft Minister Aachenbach, at Brambauer, Germany, which was equipped by Haniel & Lueg, of Düsseldorf.

The accompanying illustrations, however, will serve to give a much better idea of the extent to which such gas power is being utilized abroad. Fig. 5 shows the interior of the electric generating station, at Alsdorf, Germany, of the Eschweiler Bergwerks Verein, current from which is distributed to motors and used for lighting at all of that company's operations. This is the largest power station in the world, operated on coke-oven gas. It is equipped with engines built by the Maschinenfabrik Augsburg-Nürnberg, direct-coupled to alternating-current generators from the shops of the Allgemeine Elektricitäts Gesellschaft, at Berlin. There are nine of these units at present installed, with an aggregate rated capacity of 15,000 hp., and provision is being made for others. The gas used here is supplied from several batteries of Koppers regenerative coke ovens, partially illustrated in Fig. 4 in connection with which there is operated a byproduct plant for the recovery of ammonium sulphate, tar compounds, etc.

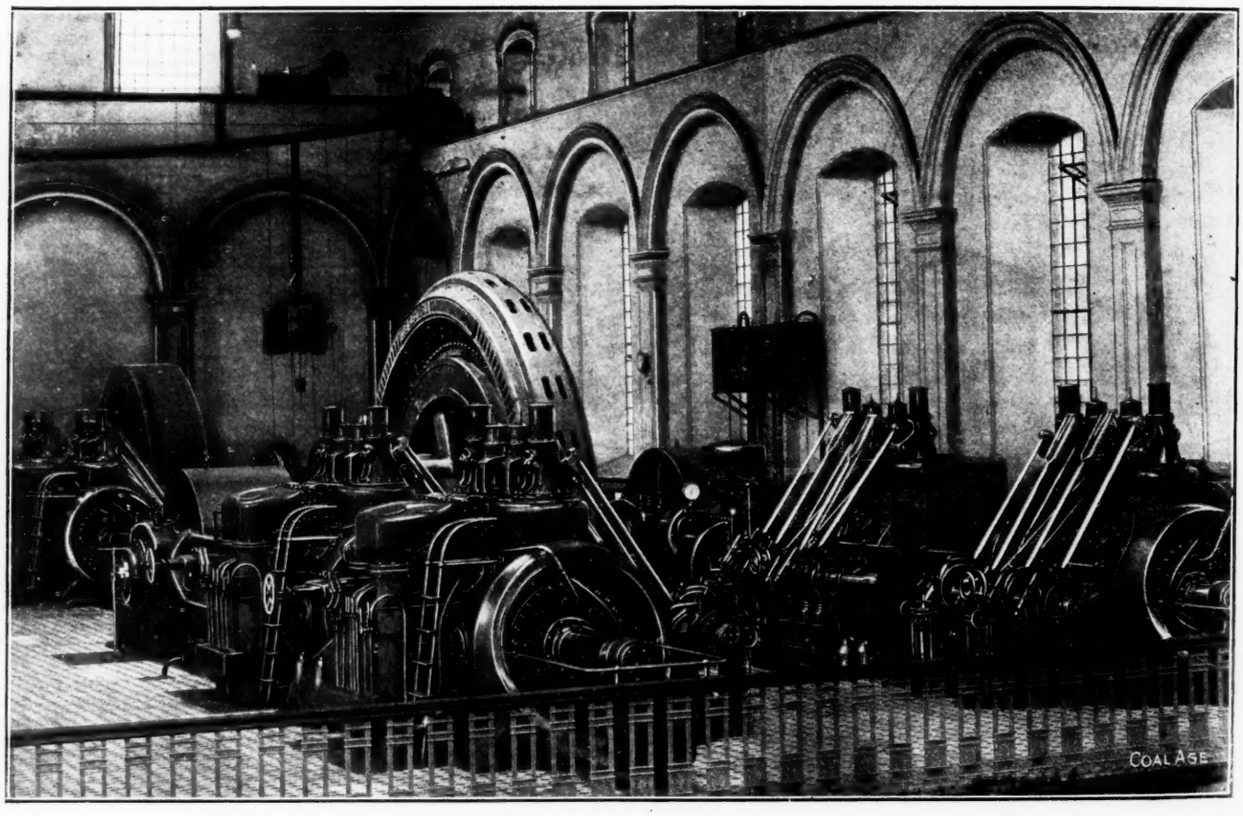


FIG. 1. GAS-POWER PLANT AT BARGOED, WALES

Originally, the gas from the coke ovens in use here, was burned under boilers, and the steam thus produced was consumed in a number of isolated engine plants installed, wherever necessary, over the wide area of the company's operations. For these comparatively small power stations, the total running expense and cost of upkeep were relatively high, particularly as it was necessary to carry a spare engine in each locality. The losses through condensation in some of the steam feeder pipes, which were, in places, of considerable length, also increased operating costs.

GAS-ENGINE DRIVEN ELECTRIC PLANT

The obvious remedy for such conditions lay in the construction of a central electric-generating station and the complete electrification of all the company's plants. When it came, however, to deciding upon the type of prime mover to be installed, the verdict was in favor of gas engines, rather than the continued use of steam, for the reason that, with a steam plant of even the most efficient type ordinarily used, it is possible to convert into power only a much smaller percentage of the calorific value of the gas than can be utilized with gas engines. The management therefore decided to dispose of the steam engines, one after another, and gradually concentrate the production of power in a gas-engine-driven electric plant.

The gas being used under the boilers at that time would not, however, do for use in gas engines; and the next problem was to secure a product sufficiently free from impurities to serve this latter pur-

pose. The installation of a byproduct recovery plant was determined upon at the same time, and this provided for the removal of tar compounds, as well as some other deleterious substances; but the necessity remained for extracting the large percentage of sulphur present, and to provide for the effective removal of this, a special cleaning plant was constructed, which, like the one illustrated in the Nov. 25 issue of COAL AGE, consists primarily of layers of bog iron laid out on rough wooden lattice-work shelves. However, in this installation, fans are used for forcing the gas through the filter frames, and the tar extractors, originally used, have been eliminated. After the Koppers-type ovens had been substituted for an older type, these extractors were found unnecessary, as the byproduct plant effectually removed all tar. A central chamber also has been provided, where, as the ore becomes saturated, it can be dumped from the frames and regenerated by exposure to the air. The two sides of the filter are operated alternately, so as to afford opportunity for this freshening process, and thus the same ore can be used for a considerable length of time.

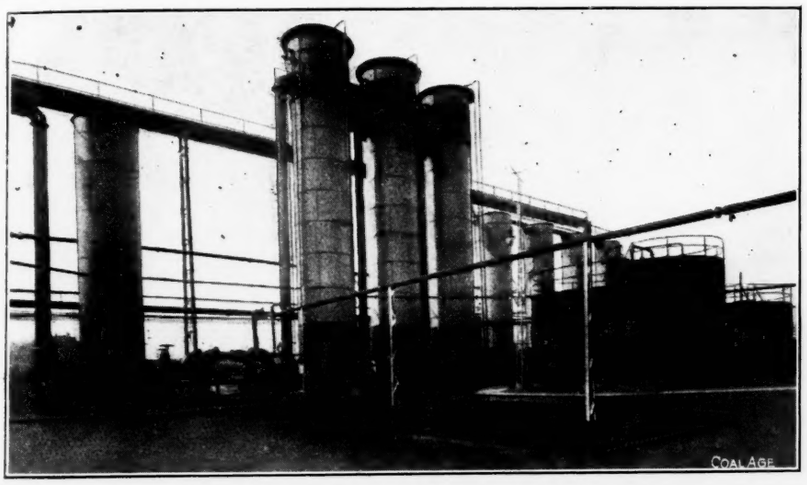


FIG. 2. KOPPERS BYPRODUCT PLANT, AT OESPEL

The gas, as cleaned, has a composition approximately as follows:

		Per cent.
Carbon dioxide	CO_2	2.00
Oxygen	O_2	0.82
Carbon monoxide	CO	5.82
Methane	CH_4	20.83
Other hydrocarbons.....	CnHm	1.40
Hydrogen	H_2	55.11
Nitrogen	N_2	14.02
		100.00

From the filter plant, the gas can be sent directly to the gas engines or to one of two gas holders, having a combined capacity of 52,500 cu.ft., from each of which two separate lines, with drain-off valves, etc., lead to the power station. Ordinarily the gas passes through these holders. To insure a sufficient supply of gas when the number of ovens in service is not equal to the demand, gas producers have been installed as auxiliaries. The present output of power represents about twice the amount, proportionately, that was formerly obtainable from the same number of ovens when steam engines were used.

COMBINED GAS-ENGINE AND STEAM-TURBINE SYSTEM

Without going further into the details of this station, which can be considered collectively with those of other plants, let us turn to the gas-power plant of the Royal Prussian Mines for the Saarbrücken district, at Heinitz, Germany.

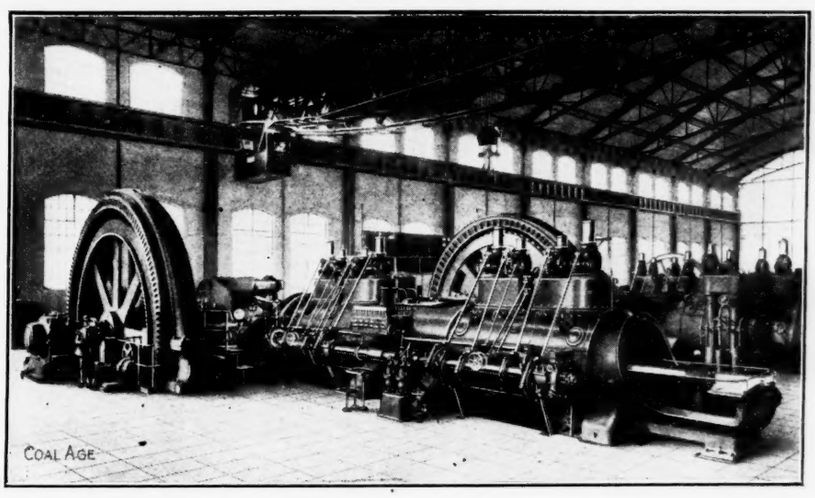


FIG. 3. GAS-POWER PLANT, AT NANCY, FRANCE

This contains seven engines, totaling 10,000 hp., and two more, which are to be put in operation before long, will increase the total to 16,000 hp. All the gas here used is supplied from Koppers ovens, similar to those shown in Fig. 4. This first passes through a byproduct plant and gas holders of 210,000 cu.ft. capacity. There are no producers held in reserve, but a steam-turbine plant at the other end of the district is connected with this station by transmission lines and operated in parallel with it, supplying whatever excess power is needed.

The gas, as it leaves the byproduct plant, is cleansed in a dry filter, which differs but little from those already described, and its average composition may be given as follows:

		Per cent.
Carbon dioxide	CO_2	2.87
Oxygen	O_2	0.98
Carbon monoxide	CO	7.46
Methane	CH_4	26.78
Other hydrocarbons ...	CnHm	3.70
Hydrogen	H_2	48.20
Nitrogen	N_2	10.01
		100.00

It will be noted, in both the cases above cited, that the gas from coke ovens is not unlike natural gas, although lower in methane. At Alsdorf it runs from 340 to 450 B.t.u. per cu.ft., and at Heinitz from 470 to 540 B.t.u. The producer gas generated in the auxiliary plant of the Eschweiler Bergswerk Verein, at Alsdorf, averages only 113 B.t.u.; so it will be seen that the coke ovens furnish a comparatively rich gas.

The situation in the Saarbrücken district is similar to that at Alsdorf, but the field is vastly more extensive, as the distribution system serves 27 mines and aggregates more than 70 miles in main cables, with a network of feeder lines. This is all linked together on the "ring" plan, and any point can be supplied from either the gas-engine plant or the steam auxiliary station at the other end of the district. Originally, each mine or group of mines was served by its own steam-engine plant. The gas engines for the Heinitz station were built by Ehrhardt & Sehmer, of Schleifmühle, near Saarbrücken, and the generators by the Felten & Guillaume-Lahmeyerwerke A. G., Frankfurt-am-Main.

In Fig. 3 is shown the 4000-hp. power station of the Societe Anonyme des Hauts-Fourneaux, Pompey, near Nancy, France, which is practically identical in appearance and in the design of the electric units with the 3000-hp. plant of the Rheinpreussen Colliery, Homberg, Ger-

many, operating on coke-oven gas. The equipment for both was furnished by Haniel & Lueg, mentioned above.

Fig. 1 illustrates one of three Nürnberg gas engines, aggregating 6000 hp., running on coke-oven gas in the power plant of the Powell Duffryn Steam Coal Co., Ltd., at Bargoed near Cardiff, Wales, and a similar plant of the same capacity, but with direct-current generators, is operated by the Luxemburger Bergwerks & in actual operation as utilized in gas engines driving alternating-current generators, to be equivalent in electric power to about 100,000 kw.hr., or 120 kw.-hr. per ton.

Comparing this with the installation of 560 Koppers ovens made for the Steel Corporation at Gary, Ind., with a coking time of 16 to 18 hours and a yield of surplus gas amounting to about 45,000,000 cu.ft., some idea can be obtained of this does not allow for reduced coking periods and refinements of practice such as nave been introduced at Joliet, Gary, Birmingham and elsewhere in this country. However, it might not be economical to convert all this energy into electric power, as there is usually a good market for much of the gas for illumination and heating in cities or towns; but the surplus for utilization in internal combustion engines would still be large.

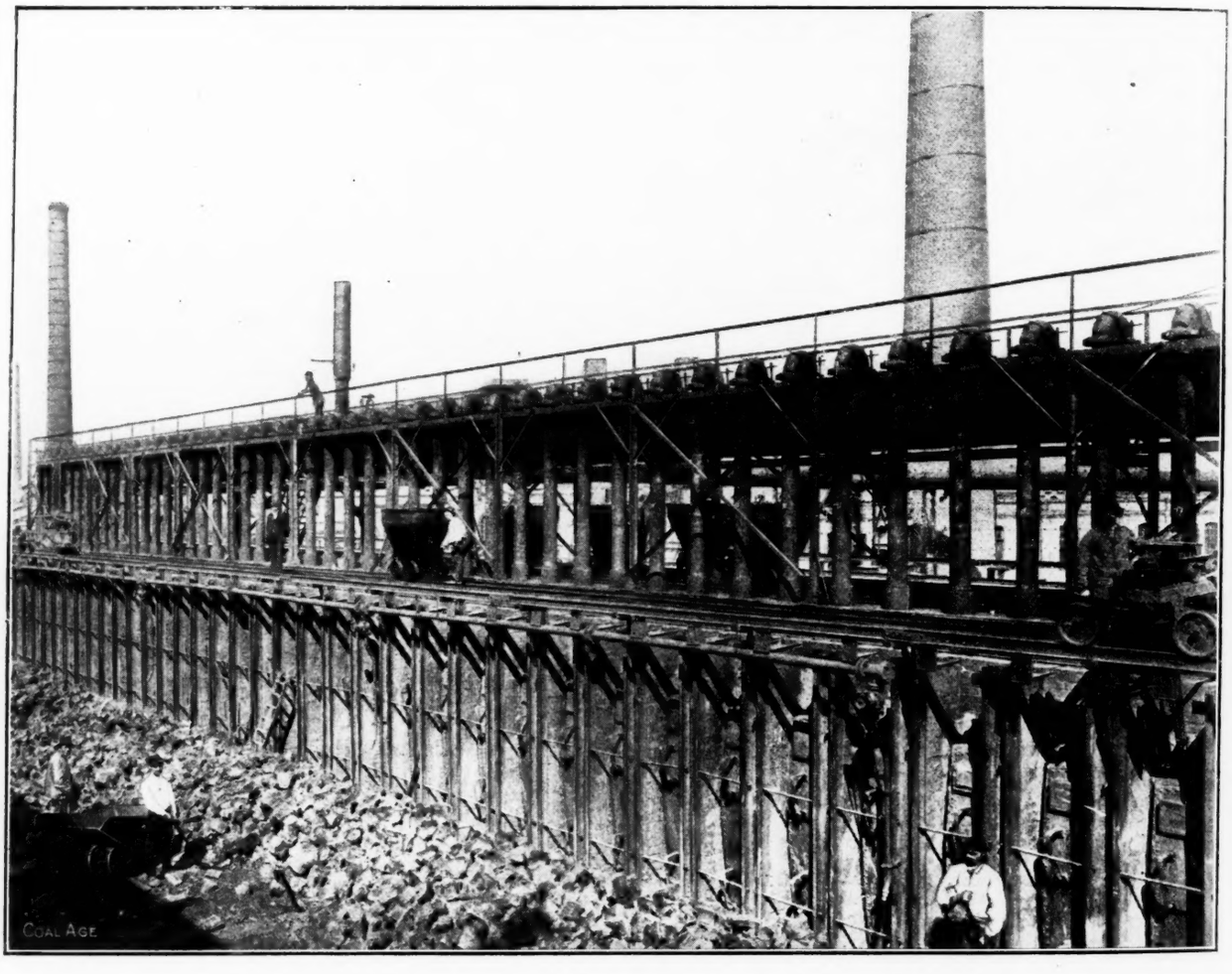


FIG. 4. KOPPERS COKE OVENS WITH BYPRODUCT PLANT IN BACKGROUND

Saarbrückner Eisenhütten A. G. at Burbach, near Saarbrücken, Germany, on a combination of blast-furnace and coke-oven gas.

POWER EQUIVALENT OF COKE-OVEN GASES

Taking the gas-power station at Heinitz as fairly representative of advanced German practice in the utilization of coke-oven gas, it may be said that 120 ovens now in service there, with the long coking period of 41 hours and a daily production of 6.7 tons of coke per oven, yield surplus gas to the quantity of 3,600,000 cu.ft. during each 24 hours. This is found, the enormous power possibilities of the latest byproduct system. By "surplus" gas is meant the quantity available after heating the regenerative ovens, which requires from 50 to 65 per cent. of the whole, and after deductions are made for other minor purposes. Taking as a basis, the figures compiled from all over the world by German engineers, notably those of the Maschinenfabrik Augsburg-Nürnberg, prior to the recent enormous percentage of increase in coking capacity, it is apparent that upward of 2,800,000 kilowatt-hours of electric energy would be available each day of the year, if all the coke consumed were to be produced in modern byproducts ovens; and even

The enormous value of the byproducts of the coking operation is also to be considered, and, as the market for these is extended, there will be more and more of a disposition to erect modern plants in place of the older types. Where the gas is to be used in gas engines, the byproduct plant is a necessity; for otherwise the matter carried in suspension and chemically combined with the gas cannot be removed without disproportionate expense. In connection with the origin of the byproduct system, it is interesting to note that an Alsatian coke-maker named Stauf, of Saarbrücken, made practical experiments along this line with a battery of ovens, as far back as 1772.

Byproduct Recovery Plants

Since that time, and particularly in recent years, a number of effective systems have been developed; among the best known are the Semet-Solvay, Otto Hoffman, Otto and Koppers. A typical plant for the recovery of byproducts, and consequently the preliminary cleansing of the gas, is described by Prof. Chas. E. Munroe, of George Washington University, in his report to the U. S. Government on coke making. First in importance in such plants, are the exhausters, which remove the gas from the ovens, draw it through the mains and coolers, force it through the scrubbers, where the tar, which exists in finely divided particles in suspension, is removed through friction, and thence lead it to the ammonia scrubbers. These are followed by the ammonia recovery plant, where weak ammoniacal liquor is converted by distillation into concentrated crude liquor or into ammonium sulphate. The gas itself passes from the ammonia scrubbers to the benzol recovery plant, where benzol is obtained by scrubbing it with dead oil. It is then drawn through the dry filter previously described, for the separation of the remaining sulphur and cyanogen compounds. The details and ramifications of byproducts plants vary widely, because the substances obtainable from crude coke-oven gas are quite numerous. So far as the subject of this article is concerned, however, the main object is to strip the gas of everything carried in suspension which would be deleterious to the cylinders or other parts of gas engines, and deliver it at the final dry filter plant with only such chemical compounds as are there readily removable. Fig. 2 is a view taken at a Koppers plant, Oespel, Germany, showing condensers, coolers, tanks, etc.

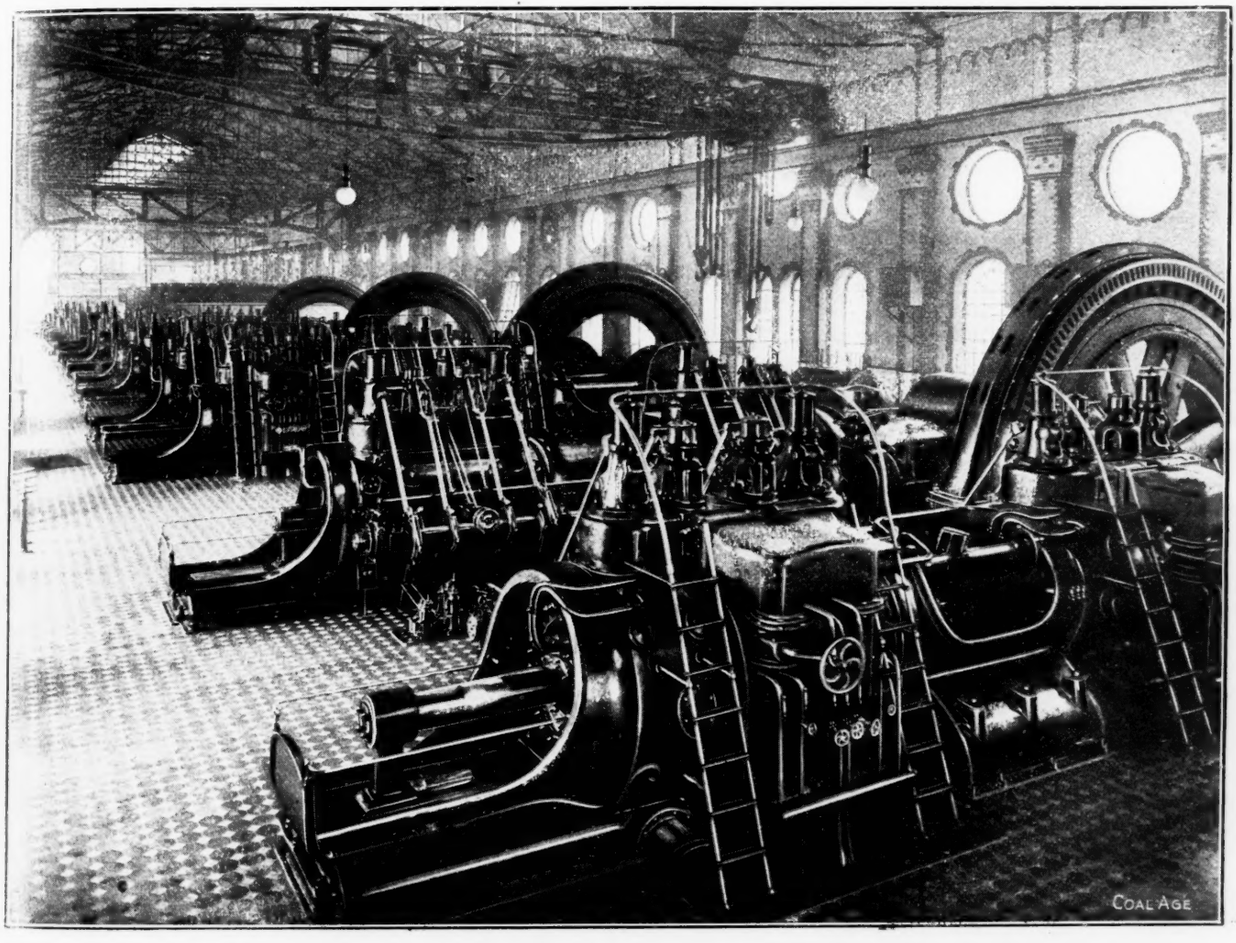


Fig. 5. Power Plant Using Coke-oven Gas, Eschweiler Bergwerks Verein

Additional power from coke ovens can also be obtained by utilization of the waste coke, or coke "riddlings" in a producer especially designed for that purpose. This system will be described in a later article.

As previously mentioned, the gas is customarily passed through holders, in which it is blended, and then drawn by natural suction to the cylinders of the gas engines. The four-cycle, double-acting type of engine has been most successfully used abroad; and for large plants twin-tandem machines, with heavy fly-wheel rotors in the generators are preferred. Quality, or constant compression, regulation has displaced the quantity regulation originally tried, and with this change there have been removed the principal difficulties which were still encountered after the problem of cleaning the gas had been solved. Trouble with the stuffing boxes, uneven heating of the cylinders, distortion of piston rods, defective ignition systems, etc., which were so discouraging at first and had such a deterrent influence upon similar efforts in this country, have practically been eliminated. Water jacketing and cooling, lubrication, etc., have also been made both effective and economical. In short, the Germans have been entirely successful in utilizing coke-oven gas for power, and there is no reason why Americans should not take due advantage of their experience.

The successful working of a coal seam depends to a large extent upon the equal distribution of the weight of the overlying strata upon the pillars. Many a seam has been lost for lack of attention to this important detail.

Portable Electric Lamps for Miners

Special Correspondence

Electric lamps, worn by the mine worker and giving a reliable light continuously for more than 12 hours, are being introduced at a number of collieries. The equipment installed at one operation of The Lehigh Coal & Navigation Co. is here described, with special reference to a charging station for the lamp batteries.

Careful experiments which the Lehigh Coal & Navigation Co. have conducted for an extended period with the portable electric storage-battery system of lighting for mine workers have given such encouraging results that the management has been prompted to take another step forward in the application of this system to the operation of its mines.

The company's electrical engineer, G. M. Kennedy, was recently directed to design a modern charging plant for the storage batteries, which would insure their being charged at constant voltage, and provide means for measuring the consumption of current, so that an accurate account of the cost of operating and maintaining the system would, at all times, be available.

There are several such charging stations in the coal fields at present, but they all receive the necessary current from nearby trolley lines, and as the line voltage on mine-haulage systems usually fluctuates from 250 volts to zero, it can readily be seen that under such conditions no storage battery will operate at a maximum efficiency. By keeping in view the conditions that should govern the recharging of storage batteries, an installation has been designed and completed that will undoubtedly set a standard to be followed by many other coal companies.

The Charging Plant

This equipment is shown in Fig. 1, as temporarily located in the safety-lamp house at the company's No. 5 colliery. As soon as the weather permits, a permanent installation will be made in a brick building, to be erected for the purpose of housing the entire equipment, and it may be well to ignore some of the details of the temporary installation and outline the permanent equipment to be located at No. 5 colliery.

A diagram of the plant, which is of ample capacity for charging 400 cells, is shown in Fig. 3. From the power house, located two miles distant, current is transmitted at 2300 volts, and is stepped down through three 2-kw., General Electric, Type H transformers to 220 volts, and thence transmitted through 1½-in. conduits to the switchboard, which was specially built for this installation by Eynon & Evans, of Philadelphia, Penn. The current passes through a 50-amp., triple-pole switch to a starting compensator, which controls the 7½-hp., General Electric, three-phase, 220-volt motor, running at 1500 r.p.m. This is direct-connected to a 5-hp., 125-volt, d.-c. interpole, compound-wound generator that furnishes the charging current. This power is transmitted through 1½-in. conduits to the switch on No. 2 panel, where one Westinghouse, 150 d.-c. volt meter, one 7½-amp. current meter, and one 5 amp. polyphase wattmeter are provided. These enable the operator to ascertain the exact amount of current that is being consumed and from these data the engineering department will be able to determine the actual cost of operation and maintenance.

There is also provided on No. 2 panel of the switchboard, an automatic reverse

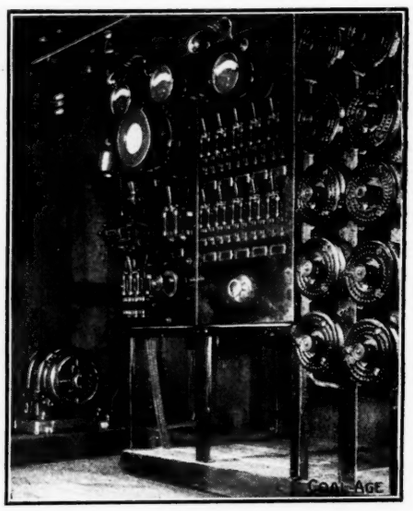


Fig. 1. Switchboard and Charging Motor

current and overload circuit breaker, furnished by the Cutter Co., which automatically opens when the current in the cells reaches a predetermined point, and thus prevents the battery current from flowing back into the generator circuit.

From the generator switch, a set of busbars connects with ten 25-amp. White return-bend switches, each equipped with a shunt coil. On No. 3 panel are 10 wall rheostats, furnished by the Cutler Hammer Co., of Milwaukee, designed to regulate the voltage, so that from 20 to 40 cells may be charged at one time in each of the 10 circuits. The charging current is measured by an 8 amp. meter that is switched into the desired circuit through the 10-circuit ammeter-shunt switch, manufactured for this installation by the Crause Hinds Co., of Syracuse.

Rack for the Batteries

The rack for supporting the batteries while they are being charged, deserves special consideration. As shown in Fig. 2, it consists of a series of shelves built one above the other on an angle of 45 deg., and easily accommodates 400 cells. The most important feature of this outfit is the contact device that runs the entire length of each shelf, and is made of No. 12 gage sheet brass, 1 in. wide. In order to charge one of the batteries, it is only necessary for the operator to push it between any pair of the jaws and it then forms a part of the circuit. By this method, all danger is removed of reversing the flow of current through the batteries, and the tedious work of connecting and disconnecting a large number of wires is obviated. Moreover, the racks always present a neat and clean appearance. The negative portion of the circuit is carried by a No. 6 wire, which terminates at the top of the racks, and from there the current is carried by a ⅜-in. brass rod which connects with each one of the contact strips. The positive leads are carried from the switchboard to the opposite end of the table and are there connected to each one of the ten brass switches.

As is usual in the case of all inventions that have successfully reached the commercial stage, there have arisen many claimants for the credit of perfecting the storage battery to the present efficient form, that now enables miners to use an electric light in their daily work. While some of the coal companies have conducted a number of experiments with storage batteries, their work has been limited to the task of making life and efficiency tests of such storage batteries as the various manufacturers have submitted for that purpose.

It remained for H. H. Hirsch, of Philadelphia, after many years of exacting research, to develop and perfect a battery that has now been accepted by coal-mining companies, as one that meets the rigid requirements of mine work, and there are now in use in the anthracite field nearly 4000 portable lamps of the Hirsch type, manufactured by the Pennsylvania Storage Battery Co., of Philadelphia.

The Hirsch Lamp

The construction of the battery is unique, in that the two electrodes are arranged horizontally and the plates are separated by a substance which is a combination of wood fiber and hard rubber. After a number of experiments directed toward finding a solid electrolyte, a material was found that, when treated with certain acids, formed a gelatinous silicic acid, which sets to a congealed jelly in

a half hour after charging, without adding to the internal resistance of the battery.

The new type of battery measures 2½x4 in. It is supported by a 1¼-in. leather belt, that either can be slung over the shoulder or secured around the waist, and as the batteries weigh only 2 lb., the miner is not encumbered in his work.

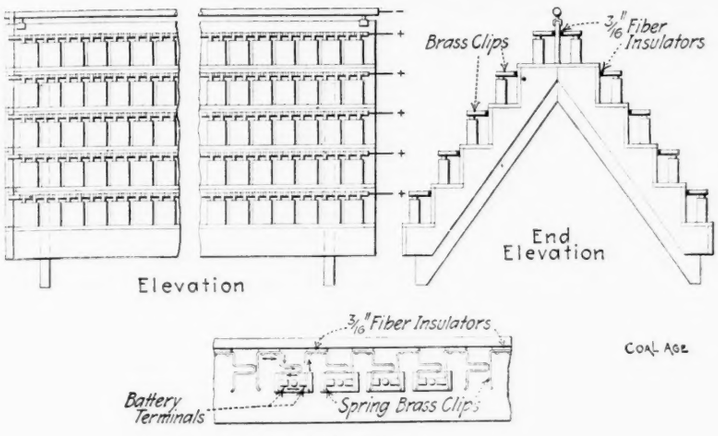


FIG. 2. CHARGING TABLE AND CONNECTIONS

From the battery, a No. 16 brewery lamp cord, with copper terminals, carries the current to the 2-cp. special Mazda lamp, which is secured to the miner's cap, furnished with the equipment. The efficiency of the light is increased by the use of a strong parabolic reflector, specially designed to produce a clear light, without shadows, and is protected from dirt or injury by a heavy glass front.

Constant use of the equipment pointed out several minor defects that were quickly eliminated by the hearty coöperation of miner, employer and inventor, and today it is possible for the miner to work for as much as 16 hours with a clean and reliable electric light furnished from one battery. In fact, on several occasions, batteries have furnished current for as long as 30 hours, and it is the hope of the Lehigh Coal & Navigation Co.'s management that when the batteries are charged under more favorable conditions than those that have hitherto obtained, a much desired increase in the life of the batteries will result, or possibly their weight may be reduced still further. The operation of the plant will be supervised by Harold Ramsey, assistant electrical engineer, who assisted in the design and supervision of the installation.

ADVANTAGES AND ECONOMY

Up to the present time, this company has furnished its employees with the portable lights free of charge, and once used, no mine worker has desired to go back to the old inefficient, smoky and dirty open light. The electric lamp has been used by the men in parts of the mines where gas was present. Also, it has been of material assistance to the firebosses on their daily tours of inspection, and although they have to carry safety lamps for the detection of gas, they now find the portable electric lights indispensable. It does not require a great deal of foresight to predict that the safety lamp will be used eventually only for the detection of gas, and that before long nearly all mine workers will be equipped with electric lights. The low voltage at which the lamp operates, precludes the possibility of igniting a body of gas by a spark from a loose connection or a short-circuit across the battery terminals, and, as the filament of the lamp will remain incandescent only in a perfect vacuum, danger from that source is quite impossible.

From an economic viewpoint, the use of the electric lamp is destined to increase. It now costs a miner from 30 to 40c. per week for oil for the naked light. The same amount weekly will cover the interest on the investment in a portable electric light, and also the cost of maintenance. Even if the coal-mining companies should ask each miner to purchase his own equipment, it would entail no added expense.

Universal use of the electric lamp would relegate to oblivion the dangerous naked light, and thus materially decrease the fire hazard underground, and mark the passing of one of the sources of preventable mine fires. The lamps are being used above ground also, where the danger of causing fires is considerable, and it is now no longer necessary for repair men to use open torches while working in the breakers. Shotfirers have found the batteries adequate for their work, and they are thus provided with an additional safeguard.

In this day and generation, when it seems popular to assail corporate interests, it is a pleasure to record a work on which progressive managers of coal companies have expended both much time and money, so that the burden of the mine workers may be lightened and the mines freed in part of their hazards and dangers.

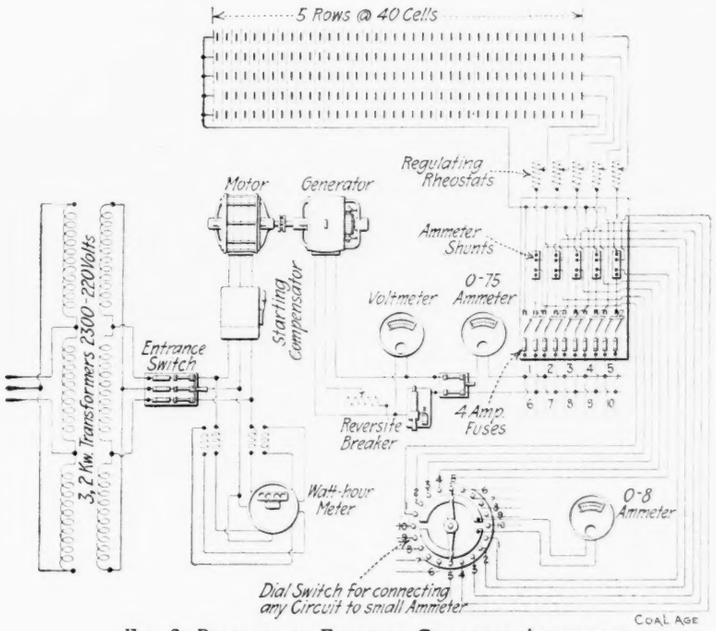


FIG. 3. DIAGRAM OF ELECTRIC CHARGING APPARATUS

Experience has shown that it is wise to install electric locomotives of a larger capacity than is necessary to deliver the required draw-bar pull, for if the motor has no reserve power but is only just able to develop the required pull under favorable conditions, then when these conditions are altered, as is sure to be the case at times, the motor is apt to prove unsatisfactory.

Central Station for Colliery Service

By E. B. Wagner*

The proposed electrification of a considerable portion of the Lehigh Valley Coal Co.'s operations in the vicinity of Centralia, Penn., has resulted recently in the construction of a central station at that point. The equipment of this installation is here described in detail.

*Electrical engineer, 56 North Washington St., Wilkes-Barre, Penn.

During the past year, the Lehigh Valley Coal Co. has put in operation the first part of its new central station, at Centralia, Penn. This company has extensive operations in the vicinity, which are widely distributed over a large territory and consequently can be served with steam power, only by a number of isolated boiler plants. The purpose of the new central power plant is to replace the steam-driven hoists, pumps and fans that are operated by the isolated steam plants, with more economical electrically-driven equipment.

The Centralia Colliery was selected as the site for the new power station, not only because it is most centrally located, but also because it is the receiving point for coal from the numerous shafts and slopes in the neighborhood. There is thus insured a plentiful supply of cheap fuel, obtained directly from the nearby breaker. To take care of the increased steam consumption at this point, due to the centralization of power supply, the erection of a new boiler plant has been started and two batteries of Stirling boilers have been installed, provisions being made for more to follow as necessity arises. A working steam pressure of 150 lb. is maintained.

The power house is of reinforced concrete, pilaster construction, with 4-in. curtain walls. Large size Fenestra steel window frames in each panel give a well lighted interior. The plant is equipped with a hand-operated 18-ton crane. Owing to the natural contour of the ground it was possible to build a retaining wall just behind the steam cylinders of the engine, thus forming a pipe way, in which are placed the steam and exhaust lines. The wall at the west end of the building was made of temporary construction so that an extension to the building could readily be made.

A general floor plan of the plant is shown in Fig. 3. The large foundation is for a 22 and 36 x 36 in. cross-compound corliss engine, running at a speed of 107 r.p.m. Directly connected to this engine is a 500 kv.-a 2300 volt three phase, 25 cycle alternator. The low frequency was adopted because the power generated will be used exclusively for hoisting, pumping, fan and haulage work, in which low speed motors can be employed to advantage.

In the northwest corner of the building is located the switchboard, with the electrolytic lightning arresters in the rear. Directly in front of this is a 75 kw. 125 volt motor-driven exciter set, operated by a 112 hp., 2200 volt, 750 r.p.m. induction motor, with squirrel cage rotor. At the side of the motor is the auto-starter. The steam-driven exciter is placed behind the motor-driven unit and consists of a 13x14-in. side crank engine connected to an 80 kw. 125 volt generator, running at a speed of 255 r.p.m. Both the exciters are shunt wound and are of sufficient capacity to supply three 500 kv.-a. generators. All generator and field wires are run in conduits placed under the floor, pot heads being placed on the end of the 2200 volt cables and condulets on the direct-current wires.

The switchboard is built of black marine-finished slate panels, 90 in. high and arranged in the following manner: Starting at the right, panel No. 1 is a double exciter panel having mounted on it two double-pole main switches, two d.-c. ammeters, a d.-c. volt meter and plugs and two field rheostats. Panel No. 2 has an oil switch equipped with an overload release for the motor-driven exciter set, and on its upper section is mounted a Tirrill regulator. Panel No. 3 is a generator panel and is equipped with an a.-c. ammeter and switch, a.-c. volt-meter and plugs, d.-c. field ammeter, indicating polyphase wattmeter, field switch, rheostat handle, main oil switch and integrating polyphase watt-hour meter.

Panels Nos. 4 and 5 are blank generator panels. Panels Nos. 6, 7 and 8 are feeder panels, each being equipped with one ammeter and automatic oil circuit breaker with inverse time element relays. At the right of the switchboard, is a swinging bracket holding synchroscope, frequency meter and power-factor meter. Following standard practice, no circuit breakers are placed on the d.-c. exciters or alternator main switches.

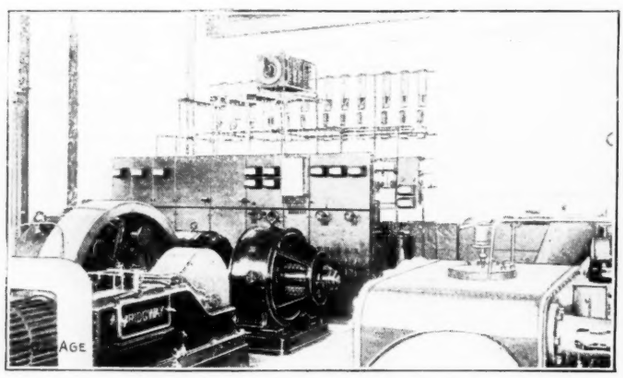


FIG. 1. NORTHWEST CORNER OF POWER PLANT

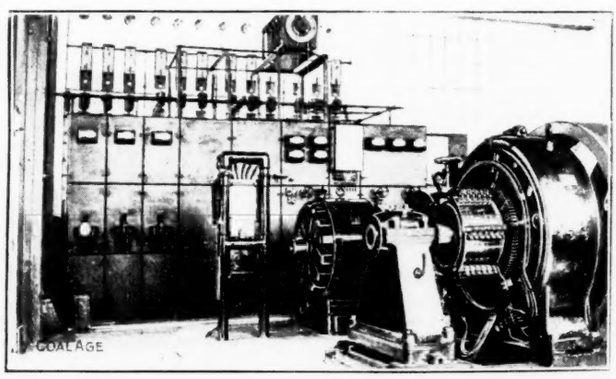


FIG. 2. EXCITERS AND SWITCHBOARD

Figs. 1 and 2 show interior views of this central station. Fig. 1 gives a general view of the exciter and switchboard. It will be noted that the alternator field rheostat is shown mounted on a pipe framework directly over the generator panel. In the rear, and above the top of the panels, the choke coils and disconnecting switches are mounted on a pipe framework, while just above them are the wall insulators, through which the 2200-volt feeders pass to the wire tower outside the building.

The method of mounting the auto-starter for the exciter motor is plainly shown in Fig. 2. This mounting consists of a 3-in. gas-pipe framework with a triple-conductor varnished-cambric cable running up inside each vertical pipe. The elbows at the top are type *LR* and *LL* condulets, the wires coming out through the porcelain bushings and entering the starter.

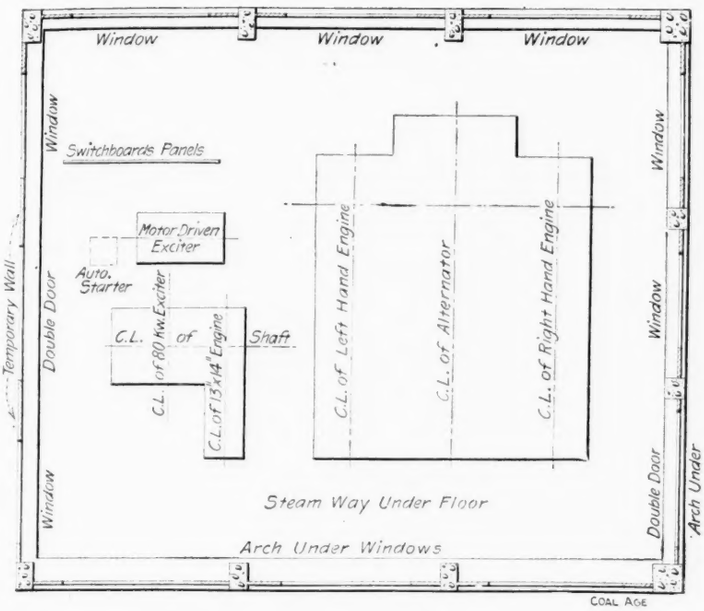


FIG. 3. GENERAL PLAN OF STATION

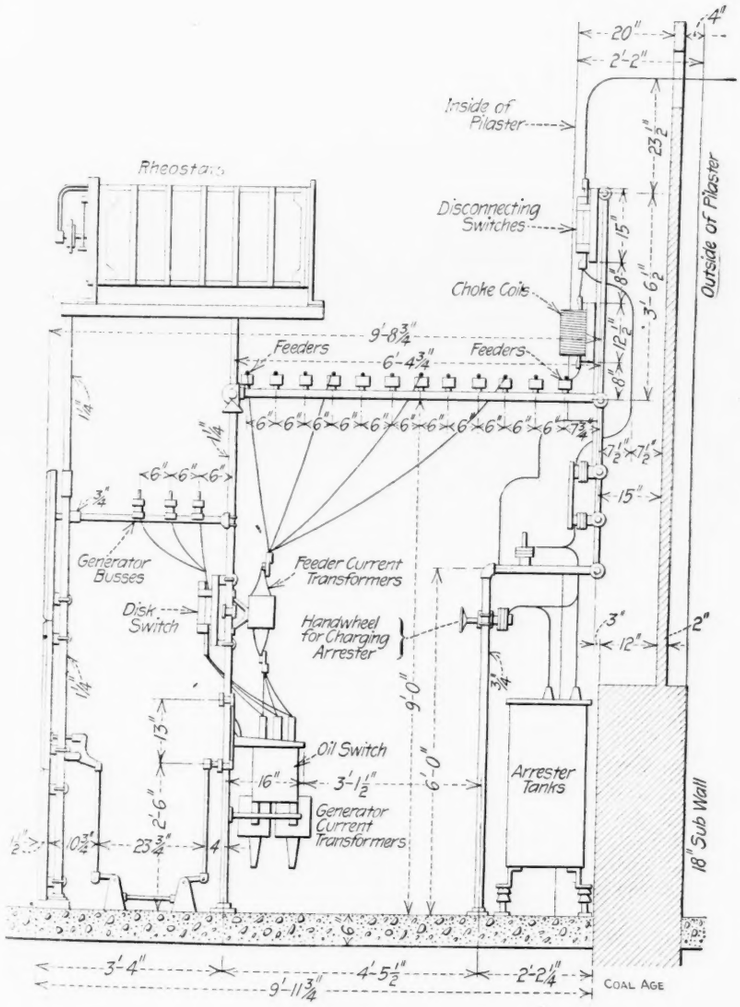


FIG. 4. SIDE ELEVATION, SWITCHBOARD AND CONNECTIONS

The insulators supporting the feed wires which run from the choke coils to the oil switches, are shown fastened to the horizontal pipe framework in Fig. 5. These were made from porcelain insulators, such as were used on the pole line, cemented to the wood screw of a gem wire clamp. A satisfactory and inexpensive insulator was thus obtained.

An end view of the switchboard is shown in Fig. 4. From this, a good idea of the general arrangement of the apparatus may be obtained. The space of 3 ft. 1½ in., from the oil switch tanks to the lightening-arrester framework, is enough to allow the attendant to enter and charge the arresters. There is also ample room to permit his reaching the

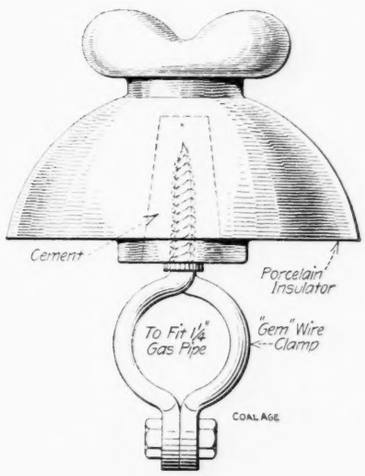


FIG. 5. DETAIL OF INSULATOR

rear of the switchboard panels if necessary, without danger of coming in contact with any of the high-tension apparatus.

For lighting the power house, the ceiling was divided into nine squares and a lighting unit consisting of one 150-watt, 115-volt, wire-type Tungsten lamp with Holophane focussing reflector was placed at the center of each square. In order to clear the crane, the mounting height was made about 22 ft. above the floor. The ceiling and walls of the building are painted white so that an illumination of from 3 to 3½-foot candles is obtained, which is ample for this class of service. A double-pole, double-throw switch is provided so that the lamps can be connected either across the 115-volt side of a small transformer placed behind the switchboard or to the exciter buss bars for lighting when the alternator is shut down. The flickering caused by the low frequency is unnoticeable in the case of the Tungsten lamps in the power house but where carbon filaments are used it is plain enought to be objectionable.

Explosion at Welch, West Virginia

By H. J. Brook*

The Jed mine explosion resulted in the death of 81 men. Thirteen were rescued, but one soon succumbed to his injuries. The mine generated gas but open lights were used. Otherwise the mine was excellently conducted. In 1908 the chief mine inspector tried to compel the use of safety lamps but was overruled by the county court.

*Consulting engineer, Welch, W. Va.

Jed mine, operated by the Jed Coal & Coke Co., is located two miles from Welch, the county seat of McDowell Co., W. Va. It is situated on the Tug River and ships its coal over a branch of the N. & W. R. R. The mine explosion which occurred in that mine on Mar. 26 at 8:10 a.m. was another of those startling surprises which the coal operator often experiences when he feels most secure, having taken due precaution against any such an occurrence by the employment of competent men to look after the general safety of the mine and miners, and having followed willingly every suggestion of the mine inspector.

An Uptodate Mine

The coal worked is the No. 3 or Pocahontas bed, and is about 5½ ft. thick in this locality. The draw slate is from 12 in. to 18 in. thick and can generally be held up in the rooms until they are driven up their full length. Draw slate is taken down in all entries, but held in place by timber in the airways and rooms.

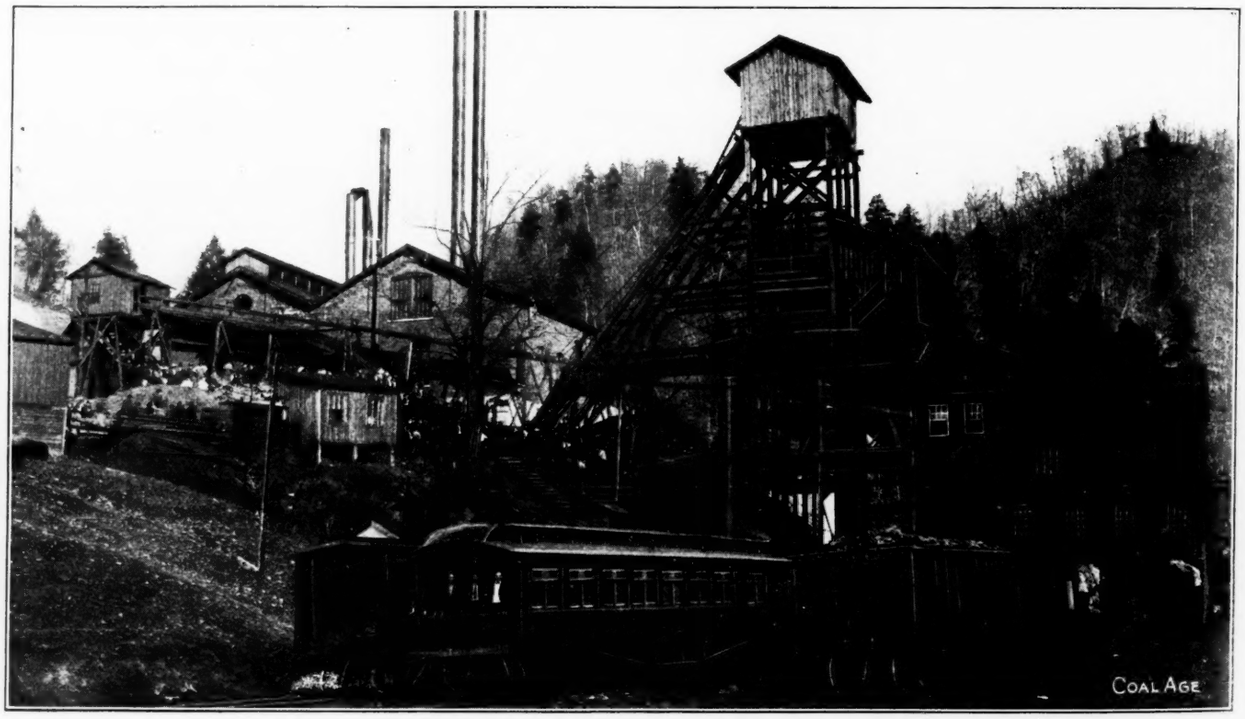
The mine is laid out on the four-entry system and is projected for two distinct and separate mine sections. It will be operated eventually with a separate air system for each section and divided throughout by a 200-ft. barrier pillar. Each separate district is subdivided into panels. At the time of the explosion the mine was ventilated by two air splits, and the fan was exhausting.

Manner of Digging Coal

The coal is dug by machines, the undercutting being done mostly at night. It is shot and loaded out during the day. R. C. Niediffes, a certificated fire boss, had charge of the night shift and he examined the mine every day before the men entered. He made report that every place was safe on the morning of the explosion.

The night shift quits at 4 a.m. and the day shift goes on at 7 a.m. As the coal which is to be removed, has all been undercut, the first duty of the miners on arriving at the working face is to place the "breaking" shots and these are fired therefore at about the same time throughout the mine. The two rib shots follow as soon as the coal from the first shot is cleaned up. No two shots are fired at once in any one working place. Three shot firers, who are certificated fire bosses, fire all shots, each taking a separate section of the mine. They use batteries for this purpose. The mine is known to give off gas, but not in dangerous quantities, and open lights are used. Where necessary, the mine is sprinkled to prevent its becoming dangerous from accumulations of coal dust. During both day and night shifts the mine was well guarded by competent mine officials.

The Jed mine, which normally employs about 125 men, was, fortunately, at the time of the explosion, working shorthanded. Owing to Saturday, Mar. 24, having been pay day, only 93 miners and company men were in the mine at the time of the explosion. The check system used at the mine shows exactly what men are below the surface at any time. Twelve men nearest the shaft bottom escaped practically unhurt, and were hoisted on the cage immediately after the explosion.

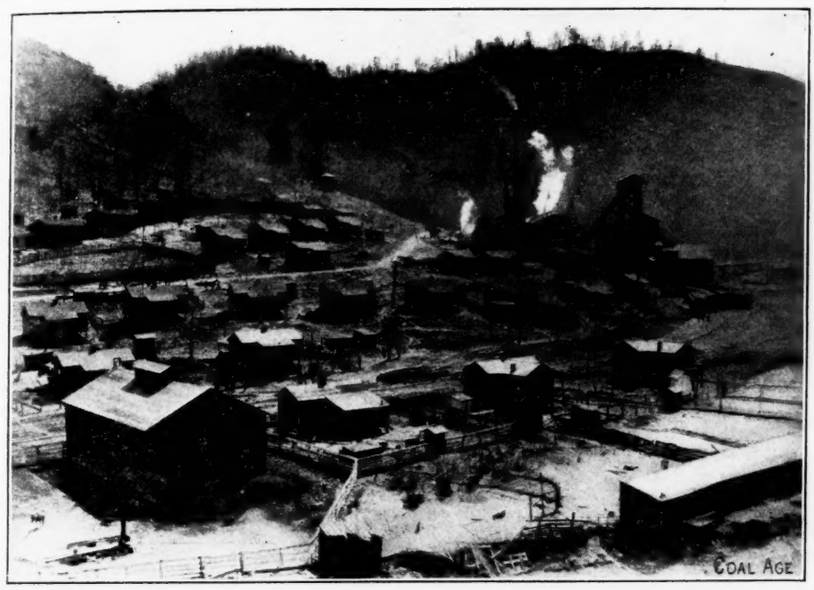


JED COLLIERY, MCDOWELL COUNTY, W. VA., SHORTLY AFTER THE EXPLOSION

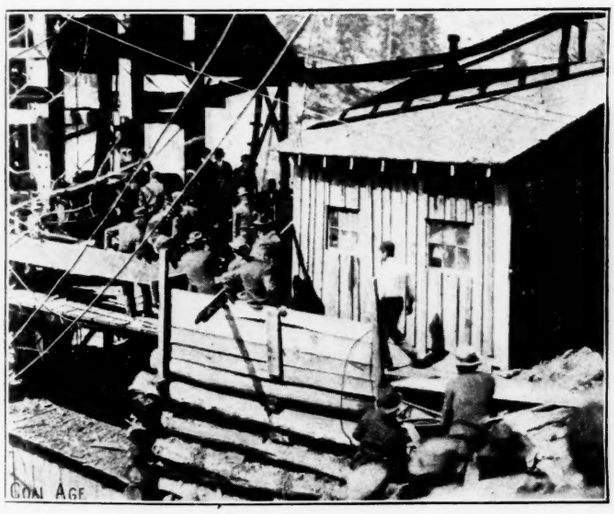
Surface Evidences of Explosion

The main shaft is 280 ft. deep and the mine is ventilated by a large Capell fan, built so that it can be reversed when necessary. The explosion was not heard far from the mine, and the report, which was of short duration, resembled the blowing

off of a boiler. At the same time black smoke issued from the fan and hoisting shaft. Neither the main shaft nor any of the hoisting apparatus was damaged by the explosion. The fan was crippled it is true but nevertheless for a while it was kept running. After all hope of rescuing any of the 81 entombed men had been abandoned, the fan was stopped, and the three damaged blades repaired, proceeded as far as the mouth of Second Main Entry, about 600 ft. from the shaft, at which point they found the door-tender, who was badly hurt. He was sent up and taken to his home, but died shortly afterward from internal injuries. The men encountered blackdamp and could proceed no further without the aid of more men and supplies to restore the ventilation. They returned to the surface where they were met shortly afterward by William Nicholson, the state mine inspector, in whose district (the 11th) the mine is located. He was accompanied by P. A. Grady, inspector of the 12th district. These men were about to descend the shaft mine of the Middle States Coal and Coke Co. on a joint inspection, when word reached them, and they lost no time in covering the four miles which separated them from the scene of the disaster.



THE VILLAGE OF JED



CROWD AT MINE LANDING

PREPARING FOR THE DEAD

so as to make its operation more effective.

RESCUE WORK

Immediately following the hoisting of the twelve men who escaped, a rescue party, comprised of O. M. Knouff, superintendent, J. Harvey Williams, mining engineer, Fred Henrichs, outside foreman, J. S. Henry, mine foreman, and three others, were lowered into the mine and

After the arrival of the inspectors, according to the custom, the mine was taken in complete charge by them. They showed themselves to be most efficient in their duties. They had the assistance of Edward O'Toole, general manager of the United States Coal and Coke Co., and J. M. Vest, superintendent of the Standard Pocahontas Coal Co., both of whom responded quickly, bringing men, tools, safety lamps and other safety devices. Edward O'Toole brought with him two men fully equipped with safety helmets. The inspectors soon organized the men into parties for the restoration of ventilation and the recovery of the dead. It was soon discovered that there was little hope that any of the entombed men could be alive.

The local inspectors were joined by Inspector Arthur Mitchell of the 10th district, who arrived at 5 p.m. on the day of the explosion. He took charge of the night relief crew. Federal Mine Rescue Car No. 7, which was *en route* to Huntington, arrived at the mine at 2:30 p.m. in charge of Mr. Burke. He and his assistants entered the mine in company with the two men from Gary, all equipped with safety helmets. They were unable to accomplish much or cover much of the mine, owing to the heavy falls of slate which made it difficult to travel with so heavy a burden.

Later the State and Federal officials, joined by Chief Inspector John Laing and State Inspectors James Martin, H. Y. Muir and Lance B. Holliday, arrived and George S. Rice, James W. Paul, M. Roudenbusch, and Dan Davis, of the Bureau of Mines, also came to aid in the rescue work and in the investigation. Both State and Federal officials will leave representatives on the ground to make a thorough examination of the mine that the cause of the explosion may be determined.

LEFT ENTRIES MOST AFFECTED

It is generally supposed from the resulting condition of the mine that the explosion originated in First butt-heading left off Second main entry. This supposition is based on the fact that the air traveled to the left butt-headings and thence up the Second main airway. On this side the explosion occurred. Moreover, the bodies brought out from the First left butt-entry and vicinity were the most badly burned. The other split traveled up the right-hand butt-headings off the First main entry and thence to the face of the latter and returned by way of the First main airway. Three of the men working in the Second butt-heading right, which is ventilated by this split, succeeded in escaping from the mine. The other nine men who escaped were also in same split but near the shaft.

Up to Saturday night 72 bodies had been recovered from the mine. Considerable difficulty was encountered in this work, owing to the blocking of the roads by heavy falls of slate and the rebratticing needed to restore ventilation. Most of the stone stoppings on the butt-entries and the concrete brattices on the mains were blown out along the course of the explosion.

Some of these bodies were covered by heavy falls of slate, which had to be removed before they could be recovered. During this rescue work in some places portable electric lights had to be used and the safety lamp discarded on account of meeting with explosive firedamp. On one occasion, by the use of these lamps, six bodies were recovered, which could not have been safely removed had safety lamps been used.

W. M. Leckie, general manager of Jed mine, was away at the time of disaster, but returned as soon as word reached him. He immediately did everything he could to relieve the situation. It is expected that by next Tuesday the mine will be in a condition that a thorough examination may be made to determine the cause of the explosion.

[Mr. Brook fails to call attention to a point of great interest in connection with this disaster. The coal beds continuously dip toward Welch from the east and at Jed much gas is encountered. Even at Vivian where the bed still outcrops to the surface at an elevation of about 30 ft. above the valley, a gas explosion recently occurred. J. G. Boyd, who was mine inspector of the 11th district in 1908, called attention in his report to the condition of the Jed mine, saying that it was not as safe in his judgment as it ought to be. In accordance with Sec. 14 of the mining law, which required all mines generating gas in dangerous quantities to be worked exclusively by locked safety lamps, he demanded that within a month open lights should be completely excluded from all parts of the mine. The general manager, Wm. Leckie, finally appealed the matter to Jas. W. Paul, then chief of the department of mines, and now in charge of the rescue work of the Federal Bureau. For a while Mr. Leckie favored conceding the demands of the department and even sent a telegram ordering the safety lamps, but he later notified the inspector of his change of opinion. J. W. Paul, D. R. Phillips and P. A. Grady then reëxamined the mine and as a result suspended operations. Finally the court granted an order for the reopening of the mine.—EDITOR.]

(Another Article on Jed Explosion Next Week)

A Comparative Test for Air Drills

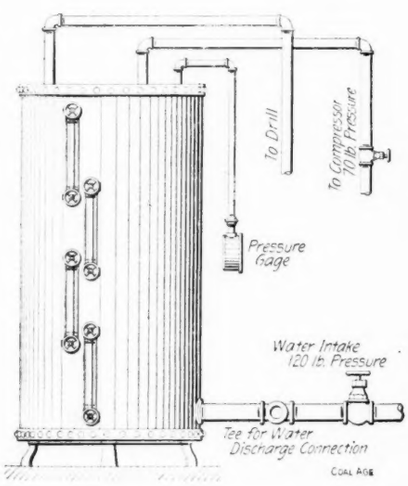
SPECIAL CORRESPONDENCE

Nearly all users of drills find it necessary or desirable from time to time, especially when about to undertake important new work or when about to purchase a large number of drilling machines, to determine the performances and relative efficiencies of the various types of drills found on the market. The arrangement described in the following paragraphs has been satisfactorily used in conducting such tests on different forms of compressed-air drills.

As shown in the illustration, a vertical air receiver is connected to the compressor line by a 1-in. pipe, fitted with a globe valve, and a 1-in. outlet pipe is led from the receiver to the drill. Water gages are placed one above the other throughout the entire height of the receiver, and a pressure gage is supplied. At the bottom of the receiver a 3-in. pipe with globe valve furnishes a water supply, and between the receiver and intake valve a tee connection is provided as a discharge.

Before starting the test, water is allowed to flow into the receiver until it is just visible in the lower gage, and a chalk mark is made opposite this level. The receiver is then filled with air at the desired pressure, the air shut off and the test begun. As the drill takes air from the receiver, the operator maintains a constant pressure by regulating the water valve. Simultaneously with the stopping of the machine a chalk mark is made at the water level then shown by the gage and the water drained off in preparation for the next test.

The distance between chalk marks, depth of drilled hole and time of drilling are noted. The cross-section of the tank being known, the distance between the chalk marks makes it possible to find



AIR TANK AND CONNECTIONS

the volume of air used, at the given pressure, and from these figures the amount of free air can be computed. A convenient form for arranging the data and results of the test is shown in Table I. The average values obtained for the last three items in the table give the information that is usually desired in this connection.

It may happen, however, that in spite of the control provided by the water supply, the air pressure will decrease during a test. In this event, the amount of free air used may be calculated as follows:

Let

P = Initial pressure,
P_1 = Final pressure,
B = Height above initial water level to top of receiver,
A = Cross-sectional area of receiver, in sq.ft.,
R = Rise of water in receiver, in ft.,
H = Atmospheric pressure.

Then each foot rise of water in the tank represents the consumption of A cu.ft. of air and if the pressure had remained constant at P, the volume of free air used would have been given by

$$V = RA \times \frac{P + H}{H}$$

However, the expansion of the air that remains in the receiver, from pressure P to P_1 represents the consumption of a volume of free air equal to

$$V_1 = A\,(B - R)\left(\frac{P + H}{H} - \frac{P_1 + H}{H}\right)$$

and the total amount of free air used is then $V + V_1$.

[It may prove more simple to let V represent the initial amount of free air in the tank at pressure P and V_1 represent the final amount of free air at pressure P_1. Then

$$V = AB\,\frac{P + H}{H}$$

$$V_1 = A\,(B - R)\,\frac{P_1 + H}{H}$$

and $V - V_1$ will give the amount of free air consumed during the test.—ED.]

TABLE I. TEST OF AIR DRILLS

Name of Drill.....
Cyl. Diam.. Stroke.. Feed.. Weight.....
Condition.....

Test No.	1	2	3	4	5	6	7	8	Average
Air pressure, (gage), lb. per sq.in.									
Size of bit, in.									
Net time of run, min.									
Depth drilled in ft.									
Rise of water in tank, in ft.									
Depth drilled in ft. per ft. rise in tank									
Depth drilled per min. in ft.									
Cu.ft. free air per min.									
Cu.ft. free air per ft. drilled									

Remarks.....

Winners in First Aid Contest

At a competitive first-aid contest, held in Connellsville, on Mar. 27, the Phillips Mine first-aid squad, of Uniontown, Penn., under the superintendence of W. J. Culleton, made a perfect score of 100 per cent. efficiency, in a series of difficult events. This particular team will represent the H. C. Frick Coke Co. at the National Meet of First Aid to the Injured, to be held in Washington, D. C., at the invitation of Major Charles Lynch, of the United States Army.

The Phillips team competed with 14 of the best squads of the Frick company, and it is therefore considered a great distinction to have made this remarkable record. The members of the squad are: Captain Harry A. Sigafoes, John Birsky, Andrew Secosky, William Shaw, Elmer Moody and Walter R. Kuhns.

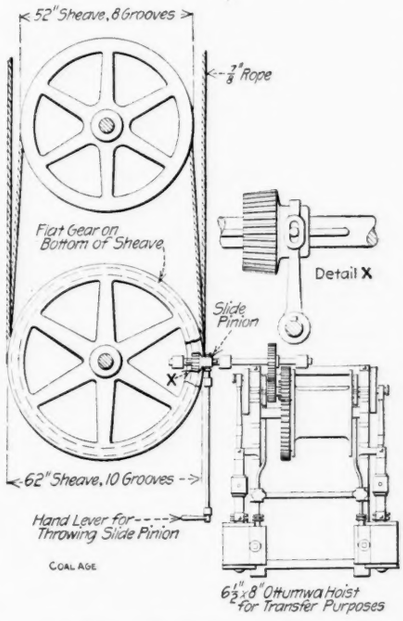
Combined Gravity Plane and Hoist

BY JOSEPH DANIELS*

A number of mines in the Roslyn district of the State of Washington are located in the hills at some height above the tipples and railroad tracks. The coal is usually sent down to the tipples by an engine, or gravity, plane. At the Roslyn Fuel Co.'s No. 2 mine, the gravity plane is 3400 ft. long, with an average grade of 14½ per cent., and crosses three ravines on timber trestles. From the mouth of the mine tunnel, the plane has three rails to the midway point. The pass-by here is 120 ft. long and below this point a single track runs to the tipple. The track gage is 30 inches.

*Department of mining, University of Washington, Seattle, Wash.

Cars are handled in trips of ten. The weight of an empty car is 825 to 850 lb.; the weight of the average loaded car is 2400 lb.; the size of the rope is ⅞ in.; and the time required to hoist or lower a trip is 2½ min. A set of gravity-plane sheaves is used to lower the cars to the tipple, but the usual arrangement has been modified, as shown in the illustration. A gear wheel is fastened to the under side of the larger sheave. This gear meshes with a small pinion, mounted on a shaft, which is driven from the main gear of the hoisting engine, as shown in the sketch. The small beveled pinion is thrown in or out of mesh by being moved back and forth along the shaft, under the control of a hand lever, located



GRAVITY SHEAVE AND HOIST

conveniently near the throttle and operating levers of the hoisting engine. This latter is a small second-motion, friction-clutch, single-drum engine, used for transfer purposes at the mouth of the tunnel.

PURPOSE OF ARRANGEMENT

The purpose of this arrangement is to enable the sheave to be driven when occasion demands; that is, if, for any reason, it is necessary to hoist the empty cars from the tipple to the tunnel mouth and there are no loaded cars available for sending down, the engine is started up and by throwing the pinion in mesh with the large gear, the sheave of the gravity arrangement is made to act as a drum for hoisting purposes. The device is also useful in case of breakdowns and derailments at any point along the road, when it may be used for putting the cars on the track, hoisting ditched cars out of the ravine and in many like contingencies.

Strike Situation in the Anthracite Field

SPECIAL CORRESPONDENCE

Anthracite mine operators are accepting with equanimity, the suspension ordered by officials of the mine workers' union. They are making no effort to mine coal and apparently will not, for some time at least, endeavor to induce any of the men to return to work. There is a general feeling on both sides that within the month an agreement will be reached and that work will be resumed within six weeks. If this happens neither mine operators nor mine workers will suffer from the suspension of work, as it will merely give the consumers time to use up much of the stock they have stored in anticipation of a strike, and make the demand for new supplies so general that fairly steady work will be assured for the summer.

Had the mine workers decided to renew their former contract for three more years, thus obviating a suspension, there would still have been a lack of work for a period about equal to the probable length of the present shutdown.

If the operators decide to offer the men a flat increase of 10 per cent., and ignore their other demands, most of the mine workers will be eager to accept these terms and return to work. Among the leaders, however, there is a great desire to fight for a recognition of the union as well as an increase in wages. Coal operators are unanimous in stating that while they might be willing to grant a 10 per cent. increase they will never agree to recognize the union, and they predict that if the miners' leaders insist on this point, then a long and bitterly fought strike is certain.

It was at first intended to submit whatever offer the operators finally made, to a referendum vote, permitting all the mine workers to express their individual decision on the question of accepting or rejecting the offer. Now, however, this plan has been changed. The miners' leaders announce that any offer will be submitted to a convention. This convention will be composed of delegates elected by the union locals, and the non-union men, who are in the great majority, will, of course, not be recognized. It is natural to expect that the delegates at such a convention will be guided largely by the advice of their leaders, and if the latter insist upon holding out for recognition of the union, as well as an advance in wages, then it is almost certain that the convention will reject the offer of the operators and follow the dictates of their leaders.

Some of the coal companies have been bringing men into the region from outside, but these are being used so far only to guard the collieries.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Freezing Method of Shaft Sinking

The following is taken from Ad. Breyre's report in the Annales des Mines de Belgique, book, LVI. Entitled "Sinking of Shafts by Freezing Method":

Considered by itself the process of freezing has on the whole, received few modifications since its first introduction; it remains in its broadest lines just as Poëtsch utilized it in 1883 in the Archibald shaft at Schneidlungen. On the other hand, the development it has taken has extended its applicability since that time to a degree that could not have been foreseen by the most optimistic, several years ago. When in 1898 the shaft at Harchies, belonging to the mines at Bernissart, was sunk by freezing to a depth of 774 ft., the attempt was rightly regarded as quite bold, for in the 15 years of the existence of the process, this shaft was the first to attain like depth; before that time they had not exceeded 410 ft.

Today applications to 656 ft. of depth are frequent. In Belgium a depth of 1000 to 1083 ft. was actually attained at Levant-du-Flénu, and in a greater part of the shafts being sunk in the Campine district of Limburg, the depth to which freezing extends approaches or exceeds 1312 ft. (400 meters).

In Germany the two shafts of the Lohberg Works which the Deutscher Kaiser Co. has established near Binslaken have attained a depth of 1361 feet.

Silesian Mining Methods

Special Correspondence

In northern Silesia the coal of the thick seams is developed by narrow stall workings driven in the lower benches of the bed. Final recovery is effected by retreating panel methods, the whole bed being extracted. Sand filling is used sometimes to replace the lower benches before the upper part of the seam is attacked.

The following is an abstract from a paper, by Berent Conrad Gullachsen, entitled the "Working of the Thick Coal Seams of Upper Silesia." The paper was presented at the meeting of the North of England Institute of Mining and Mechanical Engineers.

In the upper Silesian coalfield the workable seams amount to the great thickness of about 623 ft. and what are known as the Suddle strata contain some five to eight workable seams of from 5 to 32¾ ft. in thickness, which together give nearly 98½ ft. of workable coal, chiefly suitable for steam and household uses. Fig. 1 is a section of the strata from Zabrze to Myslowitz. The average thickness of the coal measures is 23,130 ft., the percentage of workable seams being 3.2 in the Crzescher, 11.7 in the Suddle, and 1.9 in the Rybnik strata.

Preliminary Working

In all cases the places are nearly 10 ft. wide and 6½ ft. high, except the cross-cuts, which are only 6½ ft. in width. Bore-hammers driven by compressed air, are used for driving the places; and gas being practically unknown, explosives, chiefly powder fired by fuses, are used. Very little timbering is required, as the coal is generally hard, and forms a good strong roof.

The general method of working is as follows:—When the drift reaches the seam, two headings usually 10 ft. wide and 6½ ft. high are driven water level with a coal pillar 32¾-ft. wide between them. Crosscuts are driven between these headings at 88½-ft. centers. Traveling ways and inclines are driven directly up the pitch, the first serving as a return airway for the second. They are separated by square pillars measuring 32¾-ft. in the clear between headings and crosscuts. From the incline of one pair of steep headings to the traveling way of the next pair is 256 ft., measuring from center to center. Opposite every crosscut on the traveling way, a 10-ft. stall is driven parallel to the main ground level, but as the system is a retreating one the last stall is driven first. The distance from one ground level to the next is 328 ft. The stalls are driven from the traveling way completely through to the next incline, crosscuts being cut from stall to stall every 88½-ft.

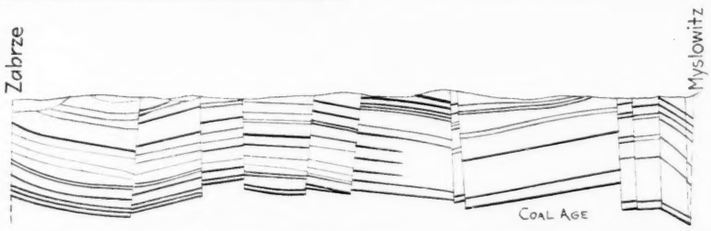


Fig. 1. Cross-section of the Badly Contorted Upper Silesian Coal Field

Working on The Retreat

When the first stall is extended to the required limit a block of coal at the end is attacked. A pillar 6½-ft. wide is left near the fallen workings adjacent, to protect the workmen, and a wide crosscut or short room is driven up the slope 20 ft. wide.

The 6½-ft. pillar separating the mine from the caved area is here called the "barrier" pillar for lack of a better name. The barrier is removed later if possible. Retreating work is commenced either at the boundary, or at old workings; and, as the working always retreats and descends, the coal is thus gradually worked out toward the ground-levels. Fig. 2 shows the method of working a district. As the barriers are often from 26 to 32¾ ft. in height, they are the most difficult portion of the coal to secure, and consequently much of it is often lost, especially where the roof is poor—the loss amounting in many mines to between 10 and 18 per cent. By sand-filling the gob, however, this loss is reduced to between 3 and 5 per cent.

The coal on the retreat is worked by two methods. That shown in the upper half of Fig. 3 is the form most generally employed. The coal is first undermined, then heavy charges of powder

are put in near the roof, and large quantities of coal are brought down. The method shown at the foot of Fig. 3 is only adopted in cases where the coal is soft and liable to break away, and in the case of a weak roof.

Fig. 4 shows the general method of timbering. When the pillars are worked out, as much timber as possible is drawn, but it is usual to leave the side props, *a*, *b*, as a protection during the working of the barrier at the side of the next lift. To make these the more apparent they are marked in solid black. The posts which sustain crossbars are shown in the appropriate places but they could not of course be seen in a correct plan view.

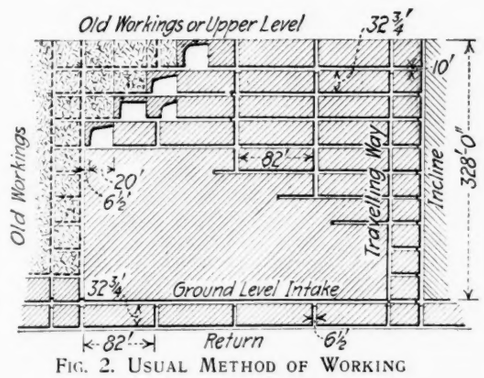


FIG. 2. USUAL METHOD OF WORKING

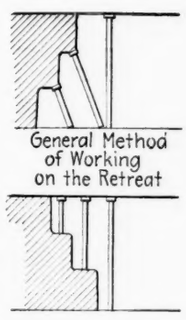


FIG. 3. DRAWING PILLARS

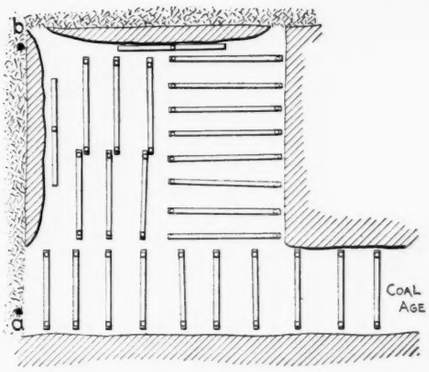


FIG. 4. POSTING A LIFT AND STALL

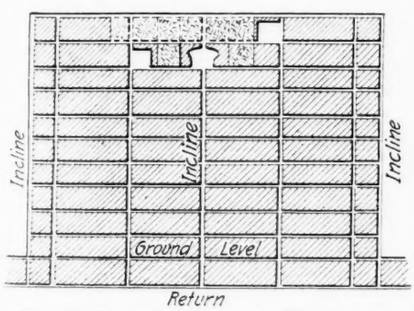


FIG. 5. RAPID METHOD OF WORKING

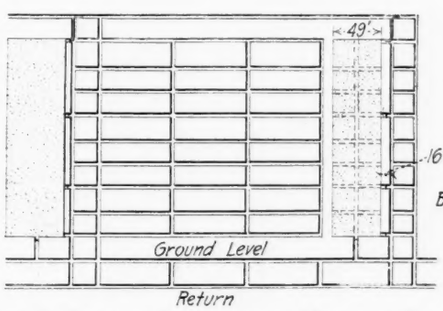


FIG. 6. PARTIAL SAND-FILLING METHOD

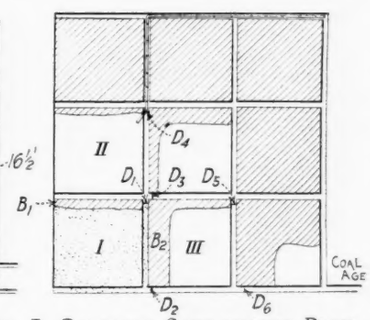


FIG. 7. COMPLETE SAND-FILLING PLAN

Much of the timber has to be left in, especially in case of sand-filling.

When it is desired to extract the pillars rapidly from a district, the method shown in Fig. 5 is employed. Half-way between the inclines, that is 164 ft. from each, a third incline is driven from one level to the level above. At the top of this incline ten-foot stalls are set away in both the right and left-hand sides, the pillar 32¾ ft. in width being left to protect the incline top, this pillar being worked out last. Thus, this middle incline is used for the extraction of three lifts, which, each being about 32¾ ft. in width, give a total of 98½ ft., having 114¾ ft. of coal on each side to be won from the other two inclines. In this manner the district is rapidly worked out. The middle incline also serves the purpose of ventilating the workings.

PARTIAL SAND FILLING METHOD

Sand-filling is now being employed more or less extensively in the majority of the thick coal mines of Upper Silesia. It is especially advantageous where spontaneous combustion is prevalent, and in mines which are worked under towns, railways, rivers, etc. There are two methods of sand-filling. In one the coal is partly and in the other the coal is wholly replaced by sand.

The former method as will be seen from Fig. 6 consists in making barriers of sand, 49 ft. in width, on both sides of each district. In order to do this a gangway is started from the ground-level, at a point 41 ft. from the traveling way, and, after being driven to the rise for a distance of 32¾ ft., stalls are set away right and left, and driven 24½ ft. in both directions, thus forming a face 49 ft. in length, which is then worked off in ascending slices. When the face has advanced some 49 to 65½ ft., a small incline-wheel is put in, and the coal is run down the incline to the level, the wheel being moved forward as the face advances. When within 32½ ft. of the boundary of the panel, the place is stopped and a connection made with the incline, and along this gangway the sand-filling pipe-line is laid, and carried to the top of the worked out area. Dams are now built at all entrances, and when they are completed sand-filling is commenced, and carried on until the entire area is filled up. A second barrier is formed in a similar manner at the other side of the district. The area of coal remaining between the two sand-barriers is now removed by the general method of working.

SAND FILLING BY SLICES

In the working of beds from 26 to 32¾ ft. thick the coal is entirely replaced by sand. In Fig. 7, the seam is worked in two slices, the pillars being worked out in an ascending order. The coal is first abstracted from pillar No. 1 in the usual manner, the pillar being about 32¾ ft. square, and should the seam be 32¾ ft. thick, the lower half only is worked. A barrier of coal, B_1, about 10 ft. wide is left, and dams D_1, and D_2 built, the sand-filling pipes being brought through the top of dam D_1 and sand filled into the worked out area. Pillar No. II is then worked, together with barrier B_1. Dams D_3, and D_4 are built, the sand-filling pipes being brought through the top of dam D_4, and sand filled into the worked-out area. At the same time as these arrangements are being carried out, pillar No. III is being worked, by a place 19¾ ft. in width, the barrier B_2 being left. Concurrently with the removal of the main part of pillar III, the barrier pillar of panel II is removed. Dams D_5 and D_6 are now built, and this lift is likewise filled with sand. Thus the work proceeds in a diagonal line towards the incline, and when all the pillars in the district have been removed and replaced by sand, the remaining overlying half of the seam is worked in precisely the same manner.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Quite a few years ago, when Charles F. Huber was a student at the Anthracite Mine Managers' University (now commonly called the Pottsville High School), he decided that when he grew up, he would get a job as boss pilot of a great coal company.

Just how to accomplish this laudable aim was not quite clear, until one day the teacher made each pupil memorize the maxim: "A Rolling Stone Gathers no Moss."

Now, Charles thought a little moss would not only relieve the sombreness of the landscape, but that it might prove useful as well as ornamental. He accordingly suited action to thought and, in 1887, when but 16 years of age, "C. F." landed a job on the engineering corps of the Lehigh & Wilkes-Barre Coal Co., at Audenried, Penn. That was just 25 years ago, and today Mr. Huber is vice-president and general manager of this same company, without having once left its employ. Not much rolling there, do you think?

The advance from backsight to mine manager was mighty gradual, and even a high-powered telescope wouldn't reveal in the career of "Charles F." any attached object bearing semblance to favoritism or pull. The motive power back of his rise was "dreary drudgery," and the fuel burned was "persistent application."

At twenty, Mr. Huber was made division engineer for his company, taking charge of the Honey Brook collieries. Seven years later (1878), he came to Wilkes-Barre as chief engineer, serving under W. J. Richards, who was then general superintendent. In 1903, when Mr. Richards switched over to the Reading company, "Charles F." succeeded him, and was still further honored in 1909, when the L. & W.-B. people appointed him vice-president and general manager of all their operations.

Mr. Huber is quick to grasp details, and there is no faltering after his decision is made. Alert, keen, with every tingling nerve right on the job, his administration has been remarkably successful, one of the chief features being the unusually low accident rate in his mines.

Right here let me disgress long enough to say that "C. F." has considerable latent ability as a political reformer. This was clearly evident when he turned his attention momentarily from mining to the exposure of a rather extended system of graft on the part of township and borough officials in the districts where his mining interests were located.

CHARLES F. HUBER

The chief requisite for the making of a successful coal-mine manager is ability to scan a broad horizon. The fellow who starts as an engineer and who believes he can never see except when looking through a transit, will eventually cause his belief to become a positive reality. Charles Huber knows underground mining and is intimately acquainted with the methods employed at all his collieries, but he can follow the course of the coal through the stages of preparation with equal understanding, and it is really in the breaker where his genius has been most apparent.

During the past decade, the greatest advance in anthracite practice has occurred in screening, cleaning and general preparation of coal. The percentage recovery, if I may borrow a metal miner's phrase, is far greater today than it was a few years ago. Culm banks filled with commercial coal are now either monuments of past waste or present ignorance.

When I asked Mr. Huber whether the next few years would witness a still further advance in breaker practice, his answer showed plainly his belief that we have pretty well tied up the loose ends and corrected the most glaring leaks. He said, "Soon we may build another breaker, and when we do, I am quite sure it will be planned along the lines of our recent Stanton plant. Here we have embodied about all we know concerning coal preparation, and I anticipate no further radical changes."

While on the subject of breakers, I naturally inquired concerning the use of concrete, as compared with steel and wood as a material of construction, and I found "C. F.'s" views on the subject quite definite. He stated, "The great trouble with steel is its inflexibility, or rather the difficulty that necessarily follows an attempt to make any considerable alteration in the arrangement of the breaker building. Because of the frequent changes in the nature of the coal at a mine where sometimes as many as nine seams are worked, we often are compelled to cut away here and there and rebuild on somewhat new lines; I am quite certain that by having a concrete substructure and bins, with timber framing above, a condition is created that will lend itself readily to whatever changes become necessary."

Answering my query about the action of acid mine waters on concrete, he replied that he believed his company had pretty well overcome this trouble at Stanton. In this new breaker, the concrete floors of the bin were treated with one coat of pigment cement filler; then a coat of No. 1375 R. I. W., and finally another coat of No. 110 R. I. W. The guarantees on this were that R. I. W. would be heatproof, coldproof, acid- and waterproof. On top of this, was placed a hardwood lining or floor. Up to the present time, there has been absolutely no absorption of water by the concrete, and Mr. Huber believes the plan adopted will remedy the serious troubles that have resulted from sulphuric acid in mine water.

I doubt if any collieries in the entire anthracite field present a more cleanly or orderly appearance than the mines of the Lehigh & Wilkes-Barre Coal Co. When I suggested to Mr. Huber that I believed his chief hobby was "cleanliness about his plants," he smiled and replied: "One of the first ideas in relation to coal I ever conceived, was that it did not necessarily follow because coal was black and in the nature of things, dirty, we should readily concede that a coal plant must be an exhibition of dirt and disorder."

Mr. Huber agrees with Carl Scholz of Chicago, that reversible fans are an unnecessary danger. In the matter of sealing off a mine fire, he advocates closing the intake side first, and states that in following this plan he has always been successful and never had an explosion as a result.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

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COAL AGE

Diplomacy

Perhaps the strongest diplomats are those who have an engaging way of expressing facts. Judged by appearances, the coal-miners' leaders have no clear understanding of the art of diplomacy. Every time a rise in wages is sought, they start to vilify the operator and try to make the man on the street bring pressure to bear on him. Already the papers are helping matters along by publishing trenchant editorials.

But what are the facts? The consumer seems convinced that the miner should have more money. He won't buy a paper which does not accord with that idea. He likes the editorials which advocate the interests of the worker, and he believes the latter has right on his side.

If the average layman only had a broader and better understanding of the situation, he would soon discover that he is the man principally interested. Eventually *he* pays the miner. We cannot see that the operator has overmuch to do with wages, so why should he take up the cudgels for the consumer who does not desire protection? Rather, let the operator rejoice that his men are doing well and better every year. He is thereby pleasing the miner and the consumer is also glad.

It is true that the bituminous operator has real competition to face from nonunion fields, and a wage advance might make conditions hard. But even here it is fairly certain that a like increase will be secured in nonunion districts.

In the anthracite region, however, with the restricted opportunity to increase output, the operators are relatively in a strong position and are more certain to retain their trade regardless of the price of coal. If competition in steam sizes troubles the hard-coal owners, they can save themselves by raising the price on their domestic output. Let the consumer pay the raise in wages; he has been clamoring to do so. Why deny him this privilege?

We would advise that the coal operator and coal miner meet as friends and connive to make an unthinking philanthropic public pay for the junket. That is diplomacy and diplomacy is peace.

The Coal Market

With the coal production of the country now seriously crippled, the condition of the fuel market becomes one of the predominating features in the industry. Until the trade is again in a normal state, COAL AGE will devote an additional page to the trade review department, in order to cover this branch in greater detail.

The market is essentially a strike market, and has been such for a number of weeks. The general trend of prices has been strongly upward for the past month, but has been accompanied by violent fluctuations, due to the varying reports from the labor conferences. These fluctuations have been so rapid and spectacular at times that the trade appeared to be almost on the verge of a panic.

Present interest is centered on the storage supplies, as any heavy, forced, buying movement at this time will undoubtedly precipitate a runaway market. No direct estimate of available supplies can be compiled for the reason that these are confined almost entirely to the bins of the consumer, and the retailer who has bought heavily in a number of instances for speculative purposes. Indirectly, most of the evidence seems to point to a substantial surplus.

That the railroad movement has been exceptionally heavy is evidenced by the report of the American Railway Association, which shows the gross surplus of idle cars, Mar. 13, to be the smallest in years. The Norfolk & Western Railroad handled a half-million more tons of coal during the first two months of the present year than in the same period last year, while the statement of net earnings of the Philadelphia & Reading Coal & Iron Co. for the month of January shows an increase of 17 per cent. It is also a fact that the anthracite shipments

for February exceeded those for the same month last year by over 800,000 tons; the awards to the anthracite miners for February amounted to 7 per cent. above the standard, the average being about 4½ per cent.

On the other hand, it is pointed out that the shortage of over 25 million tons in the foreign markets will cause a drain on our supplies. Also, that the anthracite consumption in January was 50 per cent. above normal while the surplus of 3 million tons usually on hand at the head of the lakes at this time, has been exhausted.

It will be shown later that American operators have profited considerable in the way of export business because of the strike in Great Britain. We have all heard about the futility of carrying coal to Newcastle, and most of us hardly believed that it would ever come to pass. The South American trade should be ours, and will be if we show an average order of intelligence in handling the matter.

Our Index of Coal Literature

With this number of COAL AGE we present for the first time our index of coal literature, which henceforth will appear in the first issue of each month. This list will cover in its scope, all books and articles of technical merit published throughout the world, which pertain to the coal and coke industries in their various phases and developments.

It is a noticeable fact that each separate region where coal is mined is somewhat prone to regard itself with a certain degree of self-sufficiency, and is consequently inclined to perpetuate its own methods and practices. In this connection it should be recalled that the coal industry is well-nigh universal in extent, and no one of its fields is either so alien or so remote that it may not have a practical bearing on the needs of any other district.

While the United States has outstripped all other nations in the quantity of its coal production, the mere size of this enterprise, reared as it is so largely on the abundance of our natural resources, is scarcely to be taken as evidence of the excellence of our methods; and although the coal-mining industry in this country is probably as advanced and efficient as in any other, it should be recalled that the mines of England, for instance, have already tried and discarded many of our newest schemes, and that Germany, spurred on by the exigencies of economic conditions, is constantly bringing forth developments by which we will do well to profit.

Even within the boundaries of our own country, there is a considerable lack of comprehension between the various fields and the several districts of one field. Too often, we are apt to regard conditions as peculiar to a certain region when in reality they are only a phase of a problem which is common to many. One man here labors over a difficulty which someone elsewhere has already successfully solved.

It is the mission of industrial papers, technical books and the published proceedings of our engineering and learned societies, to bring the experience of the whole industry to a focus for the benefit of the individual reader. However, these means of collecting and disseminating knowledge necessarily have their limits, and the average man has neither the time nor inclination to wade through a great deal that does not interest him in search of that which will meet his particular needs.

More often than not, the requirements of the busy man arise on the instant and at once demand all the information it is possible to gather on a certain subject. If, through the aid of an adequate index, he has previously collected such publications as have appealed to him from time to time as possible necessities, then this required fund of information is at once available.

It is scarcely necessary to emphasize the value of such a list as COAL AGE now offers to its readers. In carrying on this work we are fortunate in having effected an exclusive arrangement whereby we have the collaboration of the International Institute of Technical Bibliography. The journal of this Institute, which is not a commercial venture, is published monthly in seven sections, dealing with various branches of science and presenting abstracts which cover the entire field of engineering and technical industry. Our lists will embody such portions of these abstracts as are of special interest to our readers and the coal industry in general, together with certain additions of our own and a supervision that we are in a particularly advantageous position to give. We present this new feature with considerable confidence that it will prove of real value and will meet with general appreciation.

Social Revision

These are the days in which history is made in a hurry; opinions are being revised and changes of viewpoint take place with lightning rapidity. The sentiment of the dreamer of today becomes the accepted practice of tomorrow. A few years ago the "minimum wage" without trimmings would have served in England all the purposes of an amusing joke. Today even the London *Times*, despite its conservatism, is advocating that obnoxious socialist provision and the Premier is even urging its acceptance on the national parliament.

We are drifting faster and faster toward socialistic conditions. This would not be so deplorable if the desires of the people were not so steadfastly set in the direction of *political* as opposed to moral regeneration. As a matter of fact, socialism of any kind, whether of Marx, Lassalle or Bellamy, whether radical or Fabian, needs real socialists for success just as much as republicanism needs real republicans. It is not likely to be successfully inaugurated among people whose aims are entirely non-social and self-centered.

If everyone in a socialistic commonwealth seeks release from toil, restricted hours of work, excessive comfort, freedom from industrial restraint and such a profit from the use of the world's goods as conditions will not permit, then the provisions which the individual is seeking so diligently will only make for his impoverishment.

We have noticed that the growth of a sense of social obligation has failed to keep step with the growth of socialism. The many idle corner loafers of our cities and large towns, the needless number of men occupied at other work than industrial production, no less than the extension of the long ranks of our gilded youth show that the burdens of a socialistic life are to be shifted, mose infelicitously, on the backs of shirkers, whose dream is ever of rest and not of labor.

The new social doctrines will find their fitting environment only among those who understand that labor and bread are two inseparable entities. A few exceptions to that rule may challenge its truth, but the communities at large are fast bound to recognize its validity.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Reducing Ventilation when Firing

The question raised by U. S. Wilson and Nelson Rigsby, "Should Ventilation Be Reduced Before Firing Shots,'" COAL AGE, March 9, page 718, is, in my opinion, a very important question and should interest all mining men.

The advocates of "slowing down the fan" before or during the firing of shots in a mine, contend that while the fan is running at its usual speed a large volume of air is carried into the mine. This current of air not only aids combustion but carries in suspension more or less fine coal dust, which intensifies what might otherwise be a local and harmless explosion. They point out several instances where explosions have occurred when shots have been fired where the air current was particularly brisk. As a prevention of such occurrences they advise "slowing down the fan" and thereby reducing the air current.

The question may properly be asked: Does not the trouble from gas or dust explosion arise more frequently from the excessive use of powder in blasting, rather than from an excessive quantity of air in circulation? There is not the slightest doubt, in my mind, but that it is a dangerous practice to employ such enormous quantities of powder as are commonly used in the preparation of shots in the average coal mine and especially where the air current is strong. But, on the other hand, is it a safe expedient to adopt, at all times and under all conditions, to slow down the fan when firing? It may be that in trying to escape one danger we are running into another even greater danger.

Almost every mine generates marsh gas in greater or less quantity. In some mines, it takes every available cubic foot of air to carry off the gases generated and to keep the mine in a safe condition. To reduce the air current before firing in such mines would create a condition that does not require the aid of a blown-out shot to cause an explosion. The application of a small open light is sufficient to fire the gas that would accumulate while the circulation of air is reduced.

To illustrate this point I beg to borrow a little example that appeared in COAL AGE, January 6th, page 430, in a communication by A. T. Wade, entitled "Danger In Gassy Mines." In this case a current of 50,000 cu.ft. of air is passing per minute. The safety lamp shows one-half of 1 per cent. of gas, in the return air current; and the quantity of gas given off in the mine is therefore

$0.005 \times 50{,}000 = 250$ cu.ft. per min.

It is shown that if this air current is reduced to 3000 cu.ft. per min. the percentage of gas will then be $\frac{250}{3000} \times 100 = 8\frac{1}{3}$ per cent. Under certain conditions of shooting down coal and exposing fresh feeders of gas, this percentage might be even greater.

A little study of the matter has convinced me that, as long as we use so much powder in blasting coal, just so long will shots and explosions occur, irrespective of whether the fan is slowed down or kept running at its normal speed. It is only when we decide to adopt a different method of working, such as longwall where it is possible; and eliminate, as far as practicable, the use of powder; or reduce the amount employed to a minimum, that gas and coal dust explosions in mines will cease.

PAT HOGAN.

Canton, Ill.

Stone Dust Pioneers

Referring to the communication of A. B Jessup contained in the issue of Mar. 9, permit me to point out that J. Taffanel was not the first to form the opinion that stone dust might be of use in mitigating the violence of an explosion. It is only just that J. W. Garforth's work in this direction should be given recognition. When giving evidence before a British commission in 1891 he advocated the use of stone dust. This was nearly 20 years before the results of the Liéven experiments were published. The Atkinsons in a book published a quarter of a century ago, suggested the same means of immunizing the coal dust in the mine.

I am not a strong advocate of either barriers or zones, as a means of preventing the propagation of a coal-dust explosion because the proper aim should be not to stop such an action after it has started, but to prevent it from ever getting a start. And with this end in view, every part of a mine should constitute a stone-dust zone.

Now that stone dust appears to be coming into its own, the question may arise as to where the method was first adopted in the United States. I may say that the Victor American Fuel Co., Colo., commenced to treat their mines extensively with stone dust or rather adobe dust in March, 1911.

SAMUEL DEAN.

Delagua, Colo.

Method of Working Coal Seam

In regard to the best method of working a coal seam of the character and thickness described by Charter Subscriber, Lexington, Ky., in COAL AGE, March 2, page 686, I would recommend the following system:

Assuming that the underlying stratum forming the floor of the seam is such as can be lifted without afterward causing trouble from the swelling and heaving of the bottom, as is the case with some fireclay floors when once disturbed, I would take up from 18 to 20 inches of the bottom to gain sufficient headroom on the main entry and other haulways. Assuming the top bench of coal, 14 inches thick, to be sufficiently strong and tenaceous to make a good roof, I would leave up this top coal in all rooms and entries. The parallel entry or air course and all crosscuts and rooms should be driven in the coal under the 14-in. top bench; it will not be necessary to lift bottom in driving any of these openings.

I would turn the rooms narrow, 8 ft. wide, for a distance of 15 ft. and then gradually widen out to a width decided upon and which would be governed by existing conditions, which under a cover of 100 ft. would be, say 30 ft. wide, with 15-ft. pillars between adjacent rooms. As the rooms reach the limit or boundary I would start the work of drawing back the pillars, at the same time dropping the top coal. It is important to keep the line of pillar work at an angle that would correspond to the line of fracture of the overlying stratum or roof of the seam.

I have seen this system worked very successfully in a seam of this kind but under a thicker cover. As will be noted by all practical men this system will reduce timbering to a minimum and at the same time reduce the possibility of accidents from falls of roofs, which is the cause of the largest percentage of accidents in mining. Keeping up the top or roof coal until the work of pillar drawing is commenced will also give cleaner coal than can be secured by the

adoption of any other system, because the exposed fireclay above this coal weathers easily and drops into the coal both at the face and in transit.

J. W. POWELL,
Mine Superintendent.

Coalmont, B. C., Canada.

Ice in Shaft

Replying to the inquiry of Thomas H. Devlin, superintendent, asking for suggestion as to best method of preventing the formation of ice in a wet shaft, in winter, COAL AGE, Mar. 2, page 688, would say that if the matter of expense is not a presing consideration, I would consider the most practical plan to prevent the freezing of a downcast shaft in winter is as follows:

Select a place at the side of the shaft and make a dumb drift; or, better still, excavate a place 10 ft. wide and 20 ft. in length between walls. The walls can be made of stone, brick or concrete, the last being preferable. The foundation of the walls should be 12 ft. deep, but the headrom of the finished work need only be 6 ft. high. Roof this place with 40-lb. steel rails, with good fireclay bricks cemented between the rails, as when building an overcast, to make it air-tight.

Cover this with 12 in. of concrete to make the roof absolutely waterproof and fill in making the surface level. Put in a cement floor about 6 in. deep, laying a tile drain if necessary to provide for good drainage. Provide an opening and steps leading down into the cellar. Close this opening with sliding or hinged doors at the bottom of the steps, so as to regulate the quantity of air passing into the shaft through the cellar. Leave an opening in the walls next to the shaft, say from 4 to 6 ft. square, protected by 1-in. iron bars. This opening can also be provided with iron shutters for use in case of emergency, if desired.

This cellar is the hot-air chamber and is perfectly safe for attendants, being fireproof and waterproof. Place in this chamber as many steam radiators as may be necessary to heat the volume of air pasing through the chamber and down the shaft. These radiators should be so arranged as to heat the air to the best advantage. If desired, a portable boiler can be placed in this chamber, to be used for generating steam for use in pumping or other purposes. In this case, a hole should be left in the roof for the smokestack of the boiler.

As a further safeguard, the top of the shaft can be provided, if desired, with cheap iron shutters, which can be closed at night to cut off the cold downward current of air and prevent freezing. This plan will not require any reversing of the fan or changing of the direction of the air current, or the use of any double doors or overcasts other than those used in the present system of ventilation.

If desired, a further safeguard can be provided by placing water rings around the shaft, at different intervals, and arranging these rings so that hot salt water can be run from the surface into them and drained down the sides of the shaft. For this purpose, a common oil barrel can be used, provided with an exhaust steam pipe to heat the water, salt being added to the barrel, from time to time, as required. A pipe will be needed to conduct the water from the barrel to the water rings in the shaft. By this means very wet shafts can be kept comparatively free from ice in the coldest weather.

G. T. M.

Republic, Ala.

Carbon Dioxide vs. Carbon Monoxide

Referring to COAL AGE inquiry, page 688, Mar. 2, I desire to indorse the answer given to "Two Subscribers," Dayton, Tenn., in regard to the difference between carbon dioxide and carbon monoxide, with respect to the extinction of the flame of a lamp.

The oxygen in carbon dioxide does not exist in a free state as it does in the atmosphere, but is chemically combined with the carbon. This is true also of carbon monoxide; the oxygen it contains is combined chemically with the carbon. Carbon dioxide (CO_2), however, contains all of the oxygen with which carbon is capable of combining; but carbon monoxide (CO) can take up more oxygen, under certain conditions. On this account these two gases act very differently on the flame of a lamp. Carbon dioxide does not support combustion and extinguishes a lamp flame, this gas being incombustible. Carbon monoxide, on the other hand, is combustible; and when a light is introduced into the gas, if air is present, the CO burns, forming CO_2; in other words, the gas takes up more oxygen. It burns with a pale blue flame.

JAMES NORTHOVER.

Seanor, Penn.

Reducing Ventilation When Firing

Referring to the discussion of the question, "Should Ventilation Be Reduced Before Firing Shots," p. 718, COAL AGE, Mar. 9, I desire to say, this might work in some mines with safety; perhaps in the coal regions employing pick work, and where all the shots are fired between shifts when, in most cases, all the men are out of the mine except the shotfirers. In the anthracite region, however, shots are fired at any time during the shifts when the miner is ready. The anthracite mining law, Article 12, Rule 11, forbids the firing of any shots in a mine where locked safety lamps are used, except by permission from the mine foreman or his assistant; and requires the person in charge to examine the place and the adjoining places and satisfy himself that it is safe to fire the blast before permission is given. For this reason, the ventilating current could not be reduced before firing the shot, in anthracite mines.

There is another reason for not reducing the ventilation before firing, in such mines. In the anthracite region, the rooms are high and wide, generally, and the whole quantity of air is required to keep the place clear from gas. It would not be safe under these conditions to reduce the ventilation, if this could be done otherwise. I have worked in mines where they stopped the fan for 20 min., and the places were in the same condition after that time as before.

It would be inconsistent for me to advise slowing down the fan, or reducing the ventilation at the time of firing, knowing as I do the different methods of working here and in the "old country," where the means employed are more economical and greater safety is attained, and where firedamp is not passing from one working place to another, but is conducted directly into the return current.

GEORGE KNIGHT,
Fireboss.

Plainville, Penn.

Ice in Shaft

Referring to Thomas H. Devlin's question relating to the accumulation of ice in wet downcast shafts, COAL AGE, March 2, page 688, it seems to me that the appended note to this question does not help the solution of the problem; except by the suggestion that suitable water rings might be installed at different levels in the shaft to collect the water and render the shaft drier; and by the use of steam pipes in the shaft. I have pleasure in asking Mr. Devlin to try keeping one or two coke fires going at the top of the intake shaft and about two or three yards from the same. I have seen this remedy tried and it was very successful. The shaft was brick lined having buntons two fathoms (6 ft.) apart that carried the wooden cage guides and furnished the necessary support for the pumping apparatus, pipes, signal wires, etc.

The cages were fitted with shoes which, in the writer's opinion, were a greater source of trouble than rope guides would have been under the same circumstances. In this shaft, however, the trouble from the accumulation of ice only occurs in the severest weather.

MATTHEW STAFFORD.

South Wellington, B. C., Canada.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Duties of Fireboss Required by Anthracite Mine Law

In reading the anthracite mine law I find that it specifies in a number of places the duties of the mine foreman and his assistants, but makes very few references to the duties of the fireboss. Article 12, Rule 3, gives the mine foreman full charge of all matters pertaining to the ventilation of the mine. Rule 4 makes it the duty of the mine foremen, or his assistant, to examine all accessible parts of the abandoned portions of the mine in which explosive gases have been found, etc. Only in one place do I find a direct reference to the duties of the fireboss. This occurs in Rule 7 of Article 12, which states, "It shall be the duty of the fireboss to remain at the danger station until relieved by some person authorized by himself or the mine foreman, etc."

Can you tell me what duties belong to a fireboss under the anthracite mine law, and do coal companies have to employ a fireboss for such duties? Also, are firebosses required to have a certificate the same as mine foremen and assistant mine foremen?

P. H. MAGINNIS.

Shamokin, Penn.

There are two distinct references to the fireboss in the anthracite mine law. These occur in Article 8, Section 9; and Article 12, Rule 7. The former reference is as follows:

Section 9. And no person shall be permitted to act as fireboss in any coal mine or colliery, unless he has had five years' practical experience in mines as a miner, three of which he shall have had as a miner in mines wherein noxious and explosive gases are evolved, and the said fireboss shall certify to the same before entering upon his duties before an alderman, justice of the peace, or other person authorized to administer oaths, and a copy of said deposition shall be filed with the district inspector of mines wherein said person is employed.

The second reference is as follows:

Rule 7. A station or stations shall be established at the entrance to each mine or different parts of each mine, as the case may require, and a workman shall not pass beyond any such station until the mine or part of the mine beyond the same has been inspected and reported to be safe. It shall be the duty of the fireboss to remain at the danger station until relieved by some person authorized by himself or the mine foreman, who shall stand guard until said mine or part of mine shall be reported safe, and he shall not let any person pass without permission from the fireboss.

The present anthracite mine law certainly leaves a great deal to be assumed or understood in regard to the fireboss and his duties, in a mine generating explosive gases. Article 8 provides for the certification, by a duly appointed examining board, of the mine foreman, who must have had at least five years' practical experience as a miner and be of good conduct, capable, and sober. He must pass a satisfactory examination before the examining board and be certified by said board to the Secretary of Internal Affairs, who shall issue a certificate in due form bearing the seal of the State of Pennsylvania. The law makes no provision for the examination or certification of the firebosses, in this article, but clearly states (Section 9) that no person shall be permitted to act as fireboss in any coal mine, etc., as given above.

The usual work of the fireboss is the examination of the mine for gas by means of a safety lamp at least three hours before the time for the workmen to enter the mine, each day. By the anthracite law, Article 12, Rule 5, this work is made the duty of "The mine foreman or his assistant," no reference here being made to the fireboss. It is generally assumed in the anthracite region that the assistant foreman is the acting fireboss. According to Article 8, Section 9, no person shall be permitted to act as fireboss in any coal mine except he has had five years' practical experience in mines as a miner, three of which shall have been in mines generating noxious and explosive gases. It would seem that this requirement would prevent some mine foremen from acting as fireboss, because they have not had the required experience in mines generating explosive gases.

In the anthracite region the assistant mine foreman is the fireboss and must perform all the duties assigned to the assistant foreman in the law. The law requires (Article 12, Rule 1) the owner, operator, or superintendent of the mine or colliery to employ a competent person who shall be called mine foreman. The law also requires (Rule 2) that whenever a mine foreman cannot personally carry out the provisions of this act, he shall employ a sufficient number of competent persons to act as his assistants. Further than this, the law does not compel the employment of an assistant foreman or fireboss. The law forbids (Article 8, Section 1) any person to act as mine foreman or assistant mine foreman who is not registered as holding a certificate of qualification or service under the act.

Arrangement of Colliery Buildings

I would like to draw the attention of the readers of COAL AGE to a subject that we mining engineers in charge of construction work have long felt should receive more attention than it has in the past. It is the need of a more systematic grouping and arrangement of the buildings forming the surface plant, at a bituminous mine.

The demand is more and more urgent each year for increased economy in operation. Much attention has been given to the adoption of new methods and the installation of new and improved machinery for the handling of coal at the surface, its loading and shipment; but this very fact, the adoption and installation of methods and machinery not anticipated in the previous arrangement of the surface plant, has, in most cases, led to a most unsystematic arrangement of the buildings. As a consequence it is often necessary to transmit power long distances; to transport by inconvenient tracks and trams, parts of machinery needing repairs, or work undergoing construction; to say nothing of increased danger and annoyance caused by the multiplicity of tracks, live wires and other evils that might be avoided and should be eliminated in the design of a more up-to-date plant.

Can we not have a discussion of this subject by colliery engineers, superintendents and foremen, who have been up against the annoyances and delays growing out of a lack of arrangement? Give plans of proposed arrangements that will reduce time and cost of handling.

F. D. BUFFUM,
Mining Engineer.

Ellsworth, Penn.

Developing a Thick Vertical Coal Seam

I may soon have to take up the development of a vertical coal seam 16 ft. thick, 1000 ft. deep and one mile long. I would greatly appreciate having this question thoroughly discussed in COAL AGE. Many of the older readers must have had valuable experience in the development of such a seam of coal.

CHAS. M. SHERMAN.

Farmington, Ill.

[This is an interesting and important question, and we hope it will receive the attention it deserves.—EDITOR.]

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions

Calculations Required in Pumping

Ques.—What is the theoretical pressure, or the pressure ignoring friction, corresponding to a vertical head of 300 ft. of water?

Ans.—Ignoring friction, the pressure at the bottom of a column pipe in a shaft 300 ft. deep is the static pressure due to this head; or

$$p = 300 \times 0.434 = 130.2 \text{ lb. per sq.in.}$$

Ques.—When pumping 400 gal. of water per min. through a 5-in. discharge or column pipe, in a shaft 300 ft. deep, what is the friction head due to this flow; and what is the total head (h) and the pressure (p) at the pump, in action?

Ans.—The friction head, in feet, due to the flow of water in column pipe, in ordinary mining practice, is calculated thus,

$$hf = \frac{0.01 \times 300 \times 400^2}{8 \times 5^5} = 19.2, \text{ say } 20 \text{ ft.}$$

The total head against the pump, in this case, is, then,

$$h = 300 + 20 = 320 \text{ ft.}$$

The pressure at the pump when pumping is

$$p = 320 \times 0.434 = 138.88 \text{ lb. per sq.in.}$$

Ques.—(a) Find the diameter of the water cylinder or plunger of a pump required to handle a flow of 250 gal. a min., in 10 hours each day, assuming a piston speed of 120 ft. per min. (b) Calculate the diameter of the suction and discharge pipes for this flow. (3) If the shaft is 480 ft. deep and the available steam pressure at the pump is 60 lb. per sq.in., what will be the required diameter of the steam cylinder for this work?

Ans.—(a) The pump must handle in 10 hours all the water the shaft makes in 24 hours; or

$$G = \frac{250 \times 24}{10} = 600 \text{ gal. a min.}$$

For a piston speed $S = 120$ ft. per min. the required diameter (d) of the water end of the pump is

$$d = 5.37 \sqrt{\frac{600}{120}} = 5.37 \sqrt{5} = 12 \text{ in.}$$

(b) Suction pipe,

$$d = 0.35 \sqrt{600} = 8.57, \text{ say } 8\tfrac{1}{2} \text{ in.}$$

Discharge pipe,

$$d = 0.25 \sqrt{600} = 6.12, \text{ say } 6 \text{ in.}$$

(c) It is necessary, first to calculate the friction head caused by a flow of 600 gal. per min. through 480 ft. of 6-in. column pipe, and, say, 20 ft. of 8.5-in. suction pipe; thus,

$$hf = \frac{0.01 \times 600^2}{8}\left(\frac{480}{6^5} + \frac{20}{8.5^5}\right) = \text{say } 28 \text{ ft.}$$

The total effective head on the pump is then $h = 480 + 28 = 508$ ft.

The diameter (D) of steam end, for an available steam pressure of 60 lb. at the pump, is then found thus,

$$\frac{D}{12} = 0.7 \sqrt{\frac{508}{60}}$$

and

$$D = 0.7 \times 12 \sqrt{\frac{508}{60}} = 24.4, \text{ say } 24 \text{ in.}$$

Ques.—What horsepower of engine will be required to pump 165 gal. of water per min. from a shaft 1200 ft. deep?

Ans.—The formula in common use for calculating the horsepower of a pump assumes an efficiency of 75 per cent. for the steam end. It is

$$H = 0.00034\ Gh$$

$$= 0.00034 \times 165 \times 1200 = 67.3 \text{ hp.}$$

Ventilation

Ques.—An airway 8x9 ft. is passing 45,000 cu.ft. of air per minute; what is the velocity of the air current?

Ans.—The sectional area of this airway is $8 \times 9 = 72$ sq.ft. The volume of air passing is then

$$v = \frac{q}{a} = \frac{45,000}{72} = 625 \text{ cu.ft. per min.}$$

Effect of Fall of Barometer on Percentage of Gas

Ques.—Assuming that the abandoned workings in a mine have a total volume of 1,000,000 cu.ft. and that the air in this space contains 10 per cent. of marsh gas, how would the air current on the entry skirting these old workings be affected if the barometer should fall suddenly from 29.55 in. to 28.74 in. in nine hours? Supposing that this air current is 10,000 cu.ft. per min. and carries normally 2 per cent. of gas, what would be the percentage of gas in the current during the barometric fall, and would this change be detected readily on the safety lamp?

Ans.—Assuming the temperature of the mine air remains constant, the volume of air contained in the abandoned workings will increase or expand in the inverse ratio of the fall of the barometer. In other words, the volume ratio is equal to the inverse barometric ratio. Thus, calling the expanded volume of the air in the abandoned workings x,

$$\frac{x}{1,000,000} = \frac{29.55}{28.74}$$

$$x = \frac{29.55 \times 1,000,000}{28.74} = 1,028,183 \text{ cu.ft.}$$

Now, subtracting the original volume of the air in the abandoned workings, the volume of air thrown out on the entries is 1,028,183 — 1,000,000 = 28,183 cu.ft. of air in nine hours, or, say, 52 cu.ft. per min.

Expanded volume of air in goaves	1,028,183 cu.ft.
Original volume of air in goaves	1,000,000 cu.ft.
Volume of air thrown out on entry	28,183 cu.ft.

Quantity of gas in air thrown out

$$\frac{28,183 \times 0.1}{9 \times 60} = 5.2 \text{ cu.ft. per min.}$$

Quantity of gas in air current before change

$$10,000 \times 0.02 = 200 \text{ cu.ft. per min.}$$

Total quantity of gas during fall of barometer

$$200 + 5.2 = 205.2 \text{ cu.ft. per min.}$$

Percentage of gas

$$\frac{205.2 \times 100}{10,000} = 2.052\%$$

It would not be possible to detect this slight increase in the percentage of gas in the air current by a safety lamp.

Causes of Mine Accidents

Ques.—What causes the greatest number of accidents in coal mines (explosions excepted) and what precautions should be taken to prevent them?

Ans.—The largest number of coal-mine accidents is caused by falls of roof and coal at the working face. The precautions to be taken to prevent these accidents or reduce their number are, a more thorough inspection of the working face to discover any slips or faults in the roof, or any loose slate or rock that should be taken down, and to ascertain where timber is needed to support the roof or coal. Miners should be instructed to inspect their own working faces and to set any necessary timbers before proceeding to load their coal. The failure to do this is the cause of many accidents. In some mines it is important to adopt a systematic method of timbering the faces of rooms. A plentiful supply of the proper size of mine timbers must be kept constantly on hand and all orders for timber be promptly filed.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The apparently better news from the coal regions with reference to the chance of avoiding a long strike, has led to a decided increase in the disfavor with which propositions like the Lee bill are being viewed in Congress. Nothing has been heard thus far from the subcommittee, to which the Lee bill was sent, and so far as can be learned, nothing has been done by the Senate Interstate Commerce Committee with regard to the so called Townsend strike bill, which provides for the appointment of a commission by the President to investigate and report upon cases in which serious strikes occurred. The Townsend bill has proved distasteful to a good many members of the interstate commerce committee, and it is understood that a substitute for it will shortly be offered. In this, it will be sought to eliminate the features that have been most sharply objected to in the Townsend measure.

Attitude of Administration

Meanwhile, it is well understood that President Taft favors doing anything that the federal government legitimately can to prevent the threatened strike from becoming acute, although he is not disposed to strain the provisions of the law in order to attain that end. He has given full assurance of his interest in the situation and those who are closest to him are convinced that the problem will not be neglected in any degree whatever. It is expected that some report on the Lee bill will be made shortly, and that in this the Democrats will state the views of their party as an organization with respect to the question of federal intervention of this kind. The notion of federal interference with state activities is, of course, foreign to their principles, but they have in some instances been inclined to make an exception of so serious a matter as the coal situation has appeared likely to become.

Tenega Coal Co. Discrimination Case

The recent decision of the Interstate Commerce Commission in the case of the Tenega Coal & Coke Co. against the Louisville & Nashville R.R presents a number of points that are of considerable interest and importance even outside the region which is immediately affected.

Some of the principal findings of the Commission in this case are as follows:

A railroad company which holds itself out to the public as a common carrier, files tariffs with and makes reports to the Interstate Commerce Commission as required by law of common carriers, and engages in the transportation of interstate traffic, is a common carrier subject to the provisions of the act to regulate commerce. The character of service a railroad company renders, and holds itself out as willing to render, is the controlling inquiry in a proceeding to determine whether such company is a common carrier. The fact that a carrier maintains lower rates from points on its own line than rates in force on the same kind of traffic from nearby points on the line of another railway and not on its own line, does not of itself amount to undue discrimination against shippers at the latter points. The principal defendant renders a transportation service to owners of coal operations in the Black Mountain district of Virginia, on the line of the Virginia & Southwestern Railway, but refuses to render a like service, under substantially similar circumstances and conditions, to complainants' coal operations in the Appalachia district on the Interstate Railroad. It is, therefore, held that such conduct amounts to undue discrimination against complainants.

With reference to the question of rates, the commission expresses itself as of the opinion that there is an undue discrimination against the complainants, but that the reasonableness of the transportation charges, although investigated to some extent, is not directly involved in this case. Accordingly the Commission adds:

In the present state of the record, we are unable to determine what the rates should be in order to remove the discrimination. It may be that the defendants will be willing to establish a service to and from complainants' mines and plants, on the Interstate R.R., on the same basis as the service now in effect to and from the St. Charles mines, on the Virginia & Southwestern, and thereby remove the discrimination; and an opportunity will be given them to do so. Should they fail to reach a satisfactory adjustment, a further inquiry will be had by the Commission and such order made as may be found necessary and proper.

Alabama

Birmingham—There was some talk in this vicinity recently, to the effect that if a national strike of bituminous miners should be called, about 20,000 mine workers in the Birmingham district would respond by going out on strike. The miners here are only partially organized but it is reported that their sentiment is quite strongly in favor of backing up the demands of their fellow workers in the central states. J. R. Kenamer represented the local organization at the meeting of the miners' policy committee, in Cleveland, Mar. 25.

The controversy between Gov. O'Neal and the Sloss-Sheffield Coal & Iron Co., over the price paid for convicts is being watched with keen interest. It is believed that the company will decline to pay the requested increase for the convicts and that the controversy will eventually develop a most interesting situation. In the event of the Sloss company declining to pay the advance requested by the governor, it is believed that the entire convict supply of that company will be given to the Banner mines for service there.

Colorado

Oak Creek—E. E. Shumway, president and general manager of the Rocky Mountain Fuel Co., has purchased the property of the Junction City Coal Co., of Oak Creek. This consists of 160 acres of rich coal land on the main line of the Moffat road, four miles north of Oak Creek. The purchase price was $70,000. Mr. Shumway has given a 20-year lease on the Junction City property to W. C. Ferguson of the Empire Coal Mining Co., of Denver, who will immediately install a complete modern equipment for operation of the mine. He expects to have the property in shape for the extensive production of coal by next fall, and to employ about 200 men.

Illinois

Marissa—The tipple of the White Oak mine, belonging to the Egyptian Coal & Mining Co., of St. Louis, was seriously damaged, Mar. 26, when a portion of the structure gave way under the weight of a quantity of coal which had been piled up against it. A number of pit cars, containing the tools of miners who were leaving the workings, were buried in the débris.

Taylorville—The main shaft of the Peabody Coal Co.'s new mine at Kincaid has been sunk to a depth of 342 ft. and a 7½-ft. seam of coal has been disclosed at this level. The air shaft still lacks about 20 ft. of reaching the coal. Both shafts are being lined with concrete. When this work is completed, two more shafts, for a second mine, will be put down at a point about one mile distant. In connection with the large electric power plant which the coal company

proposes to build at Kincaid, an immense reservoir will be constructed. Water will be diverted to this from the South Fork of the Sangamon River, by means of a dam.

Collinsville—One man was crushed to death, another perhaps fatally injured and three others seriously hurt, Mar. 26, by falling slate and coal in Mines No. 2 and 3 of the Lumaghi Coal Co. Three of the men were injured by a fall of slate in Mine No. 2, while the other two were caught by separate falls of overhead coal in Mine No. 3.

Bloomington—Following an inspection trip over the Toluca & Rutland branch of the Chicago & Alton R.R., by officials of the Chicago, Milwaukee & St. Paul, it was announced that the latter road may purchase the branch road and extend it 60 miles south in order to reach the central Illinois coal field.

Indiana

Brazil—The Brazil Block Coal Co. has declared its intention to discontinue the operation of its mines after Mar. 31. This company practically made Brazil. It has opened and operated 45 mines in this vicinity and has been in operation for forty years. The company, which is practically identical with the Chicago & Eastern Illinois R.R., has a score of mines in Clay, Vermilion and Sullivan Counties. Recently, the railroad was leased to the Frisco system and this latter concern will now also lease the coal company's interests.

The German Coal Company's mine southeast of Brazil caved in Mar. 27, obstructing the mouth of the shaft and putting the cage out of commission. The miners all escaped through another shaft. The accident was costly, since the company was working hard to fill a large number of orders prior to the suspension which if it lasts ten days or more will force the factories in Brazil to close down.

Iowa

Davenport—C. M. Moderwell & Co. and the Sunnyside Coal Co. have each filed petitions against the Milwaukee railroad, alleging that the defendant company refused to accept certain cars of coal for shipment. Moderwell & Co. ask damages of $357 and the Sunnyside company a judgment of $396.

Kentucky

Whitesburg—It is reported here that an Eastern syndicate has bought 20,000 acres of coal and timber lands along the Kentucky River, Line Fork and Kings Creek in the southern part of Letcher County, at a price said to be the largest ever paid for mountain coal lands in this region. About two-thirds of the property lies along the new extension of the Lexington & Eastern R.R. It is said that development of the property will be started this year.

Lexington—A number of coal companies in the Big Sandy district recently had cause to complain of a serious lack of cars. They also declared that many cars which should have been sent into the Big Sandy section were taken into the Kanawha and New River fields. The companies affected by the shortage were: the Northeast Coal Co., the Pike Colliery Co., the Greno Coal & Coke Co., the Elkton Consolidation Coal & Coke Co., the Mitchell Coke Co., the Kewanee Coal Co., the W. K. Steel Coal Co., the Wagner Coal Co., the Little Creek Coal Co., and the Colonial Coal & Coke Co. The Interstate Commerce Commission promised that in so far as lay within its power, it would take steps to relieve the situation.

Louisville—The stockholders of the Louisville Property Co., a holding corporation of the Louisville & Nashville R.R. Co., have ratified the recent action of their directors in selling coal and timber land to Thomas Cairns, of Pineville, at $1,800,000, and Mr. Cairns states that the coal and timber property consists principally of holdings in the counties of Bell, Whitley and Knox, Kentucky, amounting to 46,000 acres, and containing the best coals, as a whole, in the southeastern Kentucky coal field. There are 12 large going coal operations already under lease. His intention is to sell in groups of from 3000 to 5000 acres.

Missouri

Bevier—All the coal mines in this district resumed operations on Apr. 3, by authority of an agreement between the operators and miners of the Southwest district, which provides that work will be continued for a period of 30 days, while a new scale is being negotiated.

Ohio

Steubenville—Fire broke out in the Robert Hill coal mine here, Mar. 23, and 12 men, who were in the mine, had a narrow escape from suffocation. A remarkable discovery was made, when it was found that apparently, a fire, which broke out in the same mine 12 years ago, had eaten its way through a mile of coal and slate. Experts are investigating the matter on the theory that the fire had been burning for 12 years and that the recent blaze came about when the last of the wall was consumed and the fire given access to the main shaft of the mine.

Cleveland—The joint conference of bituminous operators and miners, in session here, agreed on a compromise, Mar. 29, whereby all the original demands of the miners are withdrawn and the following increases in pay are to be granted: Five cents a ton for mining lump coal, 3c. for all other coal and 5.26 per cent. for men paid by the day. These terms still have to be submitted to a referendum vote of the miners and although no dissension is anticipated, it will take about two weeks to secure the necessary ratification. Meanwhile, a suspension is in effect throughout the organized bituminous fields, which will probably last from two to three weeks, pending an adjustment of the several wage contracts.

Cleveland—Owing to the extremely heavy ice in the upper lakes it is announced by the railroads that it will be May 15 before the season of lake navigation opens, instead of a month earlier as usual. In addition, it is said that the amount of coal remaining on the upper lake docks is the smallest ever known at this time of the year and the demand for coal will be unusually heavy.

Pomeroy—Some trouble was experienced recently by operators in this field on account of the high water which prevailed. A number of the mines were flooded and the production was somewhat curtailed.

Oklahoma

Muskogee—Affairs of the Sans Bois Coal Co., at McCurtain, in one of whose mines 74 miners lost their lives, Mar. 20, were placed in the hands of receivers recently by order of Judge Campbell in the United States District Court. The receivers were appointed on the petition of the Superior Savings & Trust Co., of Cleveland, Ohio, holders of a $250,000 mortgage, secured by the properties of the company at McCurtain. The banking company alleges that $55,000 in interest on the bonds is past due and that the company has other debts which it is unable to pay.

Pennsylvania

BITUMINOUS

McKeesport—Three hundred coal miners returned to work, Mar. 27, in the Camden mines, after an enforced layoff of about two weeks. It is reported that water overflowing from the Monongahela River caused the mines to be closed down, and it was impossible to resume work until the river had receded.

Greensburg—The Lacolle Coal Mining Co. has awarded contracts for the construction of 7000 ft. of railroad, a steel tipple and an electric power plant, and expects to have a production of 300 tons of coal a day in the course of the next three or four months. It is announced that a contract has been made for the sale of the entire output of the mine, up to 1000 tons a day, for a term of five years. The Lacolle company owns 174

acres of ground and the coal under 1500 acres, located one and a half miles from Bolivar. Over 1000 ft. of headings have been driven, which show the thickness of the seam to be something over 6 feet.

Monongahela—Preparations are being made to sink a new shaft for the Catsburg mine, on the Sampson farm, near here. A large ventilating fan will be installed and other improvements made.

Johnstown—The Sunnyside Coal Co. expects to reopen the upper vein of the Sunnydale mine within a week or ten days and employ an additional 100 men, in order to supply the demand for coal. The plane is being extended from the lower vein, heavier rails being put down.

The Valley Smokeless Coal Co. has posted a notice to its employees, which states that, beginning Apr. 1, an advance of 10 per cent. on present prices will be paid as long as existing market conditions continue. When the market fails, the company agrees to pay the same scale of prices as then obtains at other mines along the Somerset and Cambria division of the Baltimore & Ohio R.R.

Rumors to the effect that the Berwind-White and Merchants' Coal companies would grant a raise in wages in the Windber and Boswell fields have been officially denied.

Uniontown—The H. C. Frick Coke Co., on Mar. 30, announced a general advance in wages, effective Apr. 1. The present scale is the highest ever paid in the region, amounting as it does to $1.44 per 100 bu. The advance on room and rib coal is 6⅔ per cent., on heading coal, 5⅓ per cent., and other advances range from 5¼ to 10 per cent.

Ebensburg—S. L. Reed and Webster Griffith have about finished securing options on 8000 acres of coal land in this vicinity. The price offered is $110 an acre, and the options expire June 1. It is not known who the intending purchasers are, but the Ebensburg, Lackawanna and Cardiff companies have all been mentioned in this connection. About 5000 acres of the tract lie along the Cambria & Indiana R.R. in the Blacklick Basin and 3000 acres lie near Vetera and Colver. The land adjoins the properties of the Vinton Colliery Co. and the Commercial Coal Mining Co. Shipping facilities are good, as in addition to the Cambria & Indiana R.R. the New York Central also taps the field.

ANTHRACITE

Scranton—The People's Coal Co., owner of the Oxford colliery, in West Scranton, has offered a bonus of 10 per cent. to its mine workers if they will remain at work during any suspension that may take place in the anthracite region, and also the right to participate in any victory that may be won by the striking miners. This is similar to the course taken by the Pine Hill Coal Co. The Oxford mine, employing 300 men, was the only large anthracite colliery that worked steadily during the 1902 strike, when its whole output was sold at a premium, prices of $25 a ton being secured in some instances.

Underground settlings in the workings of the Capouse colliery of the Scranton Coal Co. threaten to wreck the big plant of the Graff Furnace Co., in the Keyser Valley section of West Scranton. Property damage to the extent of $12,000 was done, Mar. 25. Eight buildings, on ground embracing an entire city block, were so seriously affected that the company was unable to resume operations.

Shenandoah—The Madeira Hill Co., of Philadelphia, operating in this city, has struck the Buck Mountain vein, at its West Bear Ridge workings at Mahanoy City Plane. The vein shows a thickness of 10 ft. This adds new life to the Stanton colliery and means much for the Gilberton Valley.

Pottsville—Forty timbermen at the Hammond colliery of the Philadelphia & Reading Coal & Iron Co. went on a strike recently because the officials endeavored to compel them to use safety lamps without giving them any additional pay. The miners claimed they were entitled to extra compensation when forced to use this style of lamp.

Tamaqua—Because a number of men at work in the Lehigh Coal & Navigation Co.'s mines near here, refused to wear union buttons, nearly 1000 union miners quit work, Mar. 26. Officers of the coal company declared that unless the men returned to work all the collieries of the company, employing 9000 men, would be closed down.

Wilkes-Barre—Mayor Kosek, of this city, in an effort to avert a strike, recently issued an invitation to the executive heads of the cities and boroughs in the anthracite region to meet and formulate a plan whereby a strike or suspension might be avoided. This meeting was held, Mar. 28, and an appeal for intervention was sent to President Taft.

West Virginia

Bluefield—A powder explosion in the mines of the Thomas Coal Co. at McComas, near here, resulted in the injury of eight men, four of them seriously but none fatally. The men were entering the mine carrying cans of powder when a torch set fire to a bag in which the cans were carried.

Morgantown—A 20-year contract has just been closed by the Elkins Coal & Coke Co., of Morgantown, with the Lehigh Coke Co., involving 9,000,000 tons of coal, to be supplied at the rate of 1200 to 1500 tons a day, for the by-product coke ovens of the Lehigh company at South Bethlehem, Penn. Another contract just closed by the Elkins company, involves 96,000 tons of coal to be delivered to the Lackawanna Steel Co. To fill these and other contracts, a new mine will be opened in addition to the two mines already in operation in the Bretz field, on Deckers' Creek. The company is advertising in local papers for 600 workmen. Plans for the new mine have been prepared, and work on the shaft will be started early in April.

Fairmont—An announcement of vital importance to West Virginia operators was made recently by the Baltimore & Ohio R.R., to the effect that its rate on coal from the Fairmont regions to the Great Lakes would be reduced from 96¾c. to 90c. This action was the result of the further reduction of the rate from the Pittsburg field to the lakes from 88c. to 78c., thus giving the shippers in the last-named district an advantage over companies operating in the Fairmont district of West Virginia. Heretofore the Pittsburg district has enjoyed a differential of over 8c. and cutting this rate an additional 10c. was not to the liking of the West Virginia people.

Virginia

Wise—The Interstate Commerce Commission decided, Mar. 25, that through routes and joint rates for the transportation of coal and coke from mines in Wise and Lee Counties, Va., to destinations in Ohio, Kentucky and other states, must be established by the carriers operating from those mines. While no definite order was made by the commission, the case brought by the Stonega Coke and Coal Co. and others, will be held open to await for a reasonable time the voluntary action of the carriers.

Washington

Seattle—The Issaquah coal mine, a commercial landmark of the Northwest, has passed into the hands of a German syndicate for a consideration of approximately $200,000. One-half million dollars will be invested at once in improvements. The mine is owned by the Seattle, Lake Shore & Eastern and has been closed for 15 years. The name of the new company will be the Issaquah & Superior Coal Co. Before the investment was made the mines were fully explored.

Spokane—It is reported that $12,000,000 will be expended by the Northern Anthracite Syndicaate, in eastern Canada, in developing 12,800 acres of coal lands in the Groundhog Mountain district of British Columbia, 150 miles north of Hazleton. This work, which will occupy three years, includes the building of a railroad from the forks of the Skeena and Stikine Rivers to the mouth of the Nass River and Nasoga Gulf, also bunkers at points on the Pacific coast.

Personals

John Ridgney, Jr., has been appointed division engineer of Pratt No. 2 division, Tennessee Coal, Iron & R.R. Co.'s coal mines, to succeed George W. Postell, resigned.

J. J. Marshall, formerly chief engineer of the Loup Creek Collieries Co., is now in charge of extensive development work for the Gauley Mountain Coal Co., Ansted, W. Va.

Robert Fairbain, of Streator, Ill., has purchased the property of the Star Coal Co. at Galesburg and will take charge of its operations. Charles Rathbun is thus relieved of his connection with the company, which is in accordance with his desires for several years past.

A. R. Brown, who is in charge of the West End rescue station of the Bureau of Mines at Birmingham, Ala., recently made a tour of the larger coal-mining camps in the vicinity for the purpose of organizing and training rescue and first-aid corps among the miners.

Charles T. Harther, manager of the Powhatan Coal Co., of Toledo, has been made president and treasurer of the newly organized Central State Coal Co. of that city. Mr. Harther was formerly connected with the Johnson Coal Mining Co., the New York Coal Co. and the Lorain Coal & Dock Co. in Columbus.

F. R. Wadleigh, fuel engineer and assistant general manager of the Chesapeake & Ohio Coal & Coke Co., attended the recent meeting, in New York, of the American Society for Testing Materials. Mr. Wadleigh is a member of the coal specifications committee of the society. He had just returned from Cincinnati where he testified in the famous McKell case against the Chesapeake & Ohio.

A party of Colorado School of Mines students, with Professor Allen in charge, recently spent several days inspecting the Trinidad coal field. The itinerary was arranged by James S. Thompson, division engineer for the Colorado Fuel & Iron Co., and was most interesting and instructive to the students. F. P. Bayles, of the Cokedale mine, and William McDermitt, division engineer for the Victor-American Fuel Co., guided the boys through the properties under their charge.

Frank A. Prendergast, for the past ten years general manager of the Baltimore & Ohio Coal Co., of Columbus, has retired in favor of F. B. Lockhart, formerly connected with the United Coal Co., of Pittsburg. Mr. Prendergast has been anxious to be relieved of his official duties for some time. He will, however, continue to give some attention to the affairs of the company. Mr. Lockhart, the new president, is an experienced coal man and will continue the previous policies of the company.

Obituary

Wade Hampton Echard, aged 26, one of the prominent younger business men of Fayette County, Penn., died at his home in Uniontown, Mar. 11. He was educated at the Iron City Business College, Pittsburg; Grove City College, Grove City, Penn., and West Virginia University, Morgantown, W. Va. Mr. Echard was president of the Unity Coke Co., the Northern Coke Co., the Peerless Coke Co., and the Franklin Coke Co., all of Connellsville, Penn.

Construction News

East Liverpool, Ohio—The West Point Coal Co. will establish large coal-storage yards at this point. J. L. Francis is general manager.

Monongahela, Penn.—A new shaft will be put down and ventilating equipment installed in connection with the Catsburg mine near here.

Lonaconing, Md.—It is reported that the Maryland Coal Co. will expend $200,000 in extending its mining developments in this vicinity.

Morgantown, W. Va.—Plans have been prepared by the Elkins Coal & Coke Co. for opening a new mine in the Bretz field on Deckers Creek. Work on sinking the shaft will be started early this month.

Duluth, Minn.—It is reported here that C. J. Farrar, acting for the Pittsburg Coal Co., has purchased property at Ashland, Wis., on which the company will build and equip a large coal dock, at an expense of $250,000.

Pittsburg, Penn.—The Lily Coal & Coke Co. has prepared plans for a new operation at West Brownsville, to have a daily capacity of 3000 tons. The plant is to be electrically equipped, and will cost about $300,000.

Wheeling, W. Va.—The McAlpin Coal Co., operating in Raleigh County, has increased its capital from $100,000 to $200,000, and is planning extensive development of its property. John Laing is president of the company.

Bolivar, Penn.—The Lacolle Coal Mining Co. has awarded contracts for the construction of 7000 ft. of railroad, a steel tipple and electric-power plant. Offut & Bennett, of Greensburg, were given the contract for the railroad work at $17,000.

Oak Creek, Colo.—W. C. Ferguson, of the Empire Coal Mining Co., Denver, has secured a 20-year lease on the property of the Junction City Coal Co., near here, and will spend about $30,000 installing modern equipment preparatory to starting mining operations next fall.

Clinton, Ind.—Edward Shirkie, former president of the Oak Hill Coal & Mining Co., has purchased a tract of coal land along the Chicago, Terre-Haute & Southeastern R.R., and will sink two new mines. It is understood that tipples will be ordered in a short time.

Seattle, Wash.—A new company, composed of German and British capitalists and known as the Issaquah & Superior Coal Co., Ltd., has acquired the Issaquah coal mine and will spend several hundred thousand dollars on improvements and equipment. The company is represented by Albo von Alvenshaben, of Vancouver, B. C.

Publications Received

JOURNAL OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, March, 1912. 120 pages, 6x9 in., illustrated. 35c. per copy. Publication office of the Society, New York.

Some of the papers presented in this issue of the journal are: "Some Tests on Carbureters," by George W. Mumy; "Some Refractory Substitutes for Wood," by Charles L. Norton; "Power System of the Pacific Mills," by F. A. Wallace; and "Electric Propulsion of Ships," by W. L. R. Emmet.

METHODS OF ANALYZING COAL AND COKE. By Frederic M. Stanton and Arno C. Fieldner. Technical Paper No. 8, U. S. Bureau of Mines. 22 pages, 6x9 in., illustrated.

The fuel investigations being conducted by the Bureau of Mines had their inception in the work done at the government coal-testing plant, erected in 1904, at the Louisiana Purchase Exposition, St. Louis, Mo., and the analytical methods originally used by the chemists at that plant have been followed, without much change, in the subsequent chemical work of the fuel-testing plants at St. Louis, Norfolk and Pittsburg. The paper describes the original methods (which were those recommended by the committee on coal analysis of the American Chemical Society), and such modifications and changes as experience has shown advisable.

Industrial Notes

The Eastern Manufacturing Co., of Elmira, N. Y., reports that it has just filled several large orders of maple pipe for the Lackawanna and Erie railroads. During the past month the company has been busy supplying pipe for the coal mines. Three carloads of wood pipe, which were recently shipped, will be used for siphon purposes.

The announcement is made that the corporation which has existed for 15 years under the title of the Eureka Tempered Copper Works was, on Apr. 1, succeeded by the Eureka Co., with an increase of capital stock from $100,000 to $250,000. The personnel of the new corporation remains the same as heretofore. Their established line of business will be continued, and with the addition of enlarged facilities and modern equipment the company hopes to aggressively maintain the enviable reputation which it has enjoyed for almost a score of years.

The Bury Compressor Co., of Erie, Penn., announces that it is putting on the market a line of "variable volume" air compressors. These are power, steam or motor driven. It is maintained that the variable volume feature of these machines will fill a long felt want and offer an opportunity for effecting a great saving in air compressor service.

The Cross Engineering Co., Carbondale, Penn., is putting on the market a fireproof mule stall for mines. This is of concrete and steel construction and has already been adopted as standard by several of the larger anthracite mining companies. This new type of construction is made necessary throughout Pennsylvania by the recent enactment compelling all underground buildings to be made of incombustible materials.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The appearance of some tangible evidence of a settlement being reached in the bituminous scale has caused a general easing off in the coal markets. The trade immediately responded to the announcement that a tentative agreement had been effected between the delegates of the miners and operators, by a general softening of prices in all grades. That the present arrangement is only tentative and will not, in any event, become effective for some time has prevented a heavy slump in prices, which still range well above normal. It is hoped in trade circles that the suspension will be of sufficient duration to insure the heavy accumulations of strike supplies being worked off, so that on resumption of work at the mines there will be, at least, a normal demand.

In the Eastern markets, prices have fallen off appreciably, but a feeling of uncertainty pervades the soft-coal trade and there is still a strong demand in that branch, although it is not thought prices will again reach the high level of two and three weeks ago. The situation is more acute in anthracite. While a few more cargoes are still due in the coastwise trade, these are all sold ahead and will mark the completion of the hard-coal shipments until work is again resumed at the mines; the supplies on hand at the large distributing centers will be cleaned up by Apr. 10.

Heavy tonnages have been acquired in the Pittsburg district for speculative purposes, which will, no doubt, be easily worked off during the suspension. The notice of a general advance in wages, as given out by the Frick company, occasioned considerable surprise in trade circles and the market generally is erratic and entirely unsettled. There is great activity in the Ohio trade, due to freer movement on the railroads and unexpected demand from consumers short in supplies. Preparations are also being made for an active lake trade as supplies at the head of the lakes are known to be abnormally low. There is urgent demand for the West Virginia product for shipment to tidewater where cargoes for foreign destinations are being loaded almost daily; at present writing there are vessels at Hampton Roads demanding 300,000 tons of coal. The coal business in Kentucky last month broke all previous records.

The unexpected announcement at the last minute, on the part of a number of the Middle West roads, that they were confiscating fuel, has caused some uneasiness there. However, there has been considerable coal accumulated on speculation and prices are soft, the market breaking Saturday when it was heard that an agreement had been reached in the labor controversy.

The markets in the far West are entirely unaffected by the Eastern situation and the trade is normal and quiet.

Boston, Mass.

Press reports of an agreement in the soft-coal regions knocked the bottom out of what was an active bituminous market all-rail, the only delivery of importance here under present conditions. The volume of spot coal bought during the week, in anticipation of a tie-up, was the heaviest for a long while, and prices well up to $3.25 at the mines were realized in some cases, on ordinary Pennsylvania coals. It is hard to foresee what quotations will be during the next week or two, but it looks as if "strike prices" had once more gone into history, so far as concerns soft coal.

If anthracite barges are put into the bituminous trade, it will mean a largely increased tonnage of the Pennsylvania grades out of New York and Philadelphia. During the flurry we have been going through, very little was heard about quality. The anthracite companies have now practically closed the gate, and after a few more cargoes are shipped, there is no hard coal expected to be available until after mining is resumed. Premiums up to $2 have been paid for coal alongside Boston, but part of this covers the extra water freight on outside tonnage. All-rail, from $1.10@1.75 extra, has been paid for stove and chestnut. The Boston dealers advanced screenings to $3.50 on the first.

Wholesale prices have been as follows:

Clearfield, f.o.b. Philadelphia	$3 75@4 00
Clearfield, f.o.b. New York	3 75@4 25
Clearfield, *en route*, f.o.b. mine basis	2 35@3 25
Pocahontas, New River, f.o.b. Hampton Roads	4 75@5 00
Pocahontas, New River, Boston, on cars	6 50@7 00
Pocahontas, New River, Providence, on cars	6 00@6 75
Anthracite, stove, chestnut, alongside Boston	7 25@7 75
Anthracite, chestnut, all-rail, mine basis	4 55@5 30

Water freights from New York to Providence slumped to 75@80c. during the week, on account of the lack of hard coal at the piers. The old figure of $1.40 is still the rate from Hampton Roads to Boston.

New York

Prices on bituminous in the New York market have eased off further, although still considerably above normal. Quotations are nominally about $2.90@3.65 alongside, although there have been some figures named as low as $1.05 at the mines. Most of the bituminous mines shipping this trade are continuing at work and the supplies are good. The large corporations here have facilities for storing a 90-day supply and no serious results are anticipated from a short suspension at the mines.

Considerable surprise and consternation were caused in shipping circles here by the announcement on the part of the Cunard and White Star steamer companies of their proposal to insert a strike and war clause in all contracts. The ocean liners are now obliged to coal for the round trip and each extra ton of fuel thus carried means a ton less of freight.

The situation in anthracite is somewhat more urgent. The hard-coal mines are now definitely closed, the arrivals have ceased and by Apr. 10 all supplies in the hands of the large distributing companies will be cleaned up. It is believed that any consumer caught short after that date will be obliged to pay a high price. Supplies of the steam sizes available at this time are estimated at about 50 or 60 thousand tons, while under normal conditions they are usually about 100 thousand.

Domestic sizes of anthracite sold up as high as $6.50 last week, but wholesale prices f.o.b. New York now, are about as follows:

Broken	$5.50@6.00
Egg, stove and nut	5.50@6.00
Pea	4.50
Buckwheat	4.10@4.50
Rice	3.10@3.50
Barley	2.25@2.50

Philadelphia, Penn.

The first week of the suspension of anthracite mining operations finds the trade in this vicinity a little flat. Of course, this is in a measure due to the fact that there is practically no coal for sale by the wholesalers, but notwithstanding this fact, the dealers report that the demand is not abnormal, nor in any way insistent. As a matter of fact, the op-

timistic views expressed by the newspapers regarding a prompt settlement of the trouble between the miners and operators, has probably had the effect of causing householders to postpone any purchases of coal that they really do not require for immediate consumption, feeling that there is a possibility of getting it at the reduced circular prices.

There probably is some ground for the supposition that the suspension will not be of long duration, at the same time there is a feeling that an adjustment of the difficulty is not so near as many are led to believe. This city went into the first week of the suspension not very well supplied with fuel, except in isolated cases. It is understood that the street railway and gas companies are in fairly good shape to stand a prolonged siege, but the majority of other industries, being handicapped for stocking space, have comparatively short supplies on hand, and a month, or six weeks at the most, will find numerous manufacturing establishments seriously embarrassed. It has resolved itself into a waiting game, and the most optimistic do not predict any settlement for a month at least.

Pittsburg

Bituminous—The entire trade, probably, was surprised that the operators and miners reached an agreement at Friday's meeting in Cleveland, though the terms of settlement are approximately what has been expected for some time. Undoubtedly the acute scarcity of coal, as accentuated by the strike in England, had a great deal to do with the settlement. The mines were idle the first day of the week, but the referendum vote will probably result in the great majority starting in between two and three weeks.

There is a large quantity of coal held speculatively, but as the mines are to be idle for some time yet the holders will make every effort to realize on it, and there has been no drop in prices thus far. While the large consumers had stocked up, the smaller ones as a rule have been carrying no important stocks, and there will probably be demand sufficient to liquidate the speculative stocks.

The market is entirely unsettled, but we repeat last week's quotations as representing nominally the market, coal being easier to secure at the figures than was the case a week ago: Mine-run and nut, $1.50@1.60; ¾-in., $1.65@1.75; 1¼-in., $1.90@2; slack, $1.40@1.50, per ton at mines, Pittsburg district.

Connellsville Coke—To the entire surprise of the trade and the workmen, the H. C. Frick Coke Co. late Sunday night posted notices of an immediate general advance in wages at all its plants. The other operators will follow suit, as usual, and the extras paid at various operations, particularly in the Klondike, where coal is harder to mine, will be continued. The advance was probably prompted by the advance granted in the union districts, the Connellsville coke trade being anxious to keep its industry unorganized.

The coke market has been very unsettled, with light demand and very scant supply. Late last week prompt furnace coke advanced again, and sold at $2.40, against our quotation a week ago of $2.25. There were sales on last Saturday at this figure, although it was known that an agreement had been reached in the union bituminous districts, and the same figure is asked today.

Baltimore, Md.

Prices of coal in the Baltimore market have been easier than during the previous week, but the demand continued heavy. Practically all grades of fuel, have dropped from 20@25c. per ton, due to the free movement on the railroads, and a substantial increase in the output. Weather conditions have favored mining operations, and the railroads have handled the traffic in good shape throughout the week. The car supply improved considerably, and there was little delay in getting the product to market.

Although it appears that the strike situation in England will be cleared shortly, the demand for coal abroad still continues brisk. The Consolidation Coal Co. closed contracts during the week for 18,000 tons of fuel destined for Buenos Ayres and Naples, 12,000 going to the South American port, and 6000 to Italy; more shipments are to be made as soon as the loading can be completed.

Local companies are intensely interested in the situation. While the majority of operators here employ non-union men, there are others who have on their payrolls between 8000 and 10,000 union miners, and if there is a strike, they will feel it.

Buffalo, N. Y.

The bituminous trade is slowing down very fast, and consumers are mostly well supplied, some of them having laid in a six-months stock. There has been a large amount of coal moving and the fact that it has sold at from 50c. to $1 over the price of a month ago has not kept many from buying. So eager were buyers to get out of the trade as soon as it was safe, however, that it was the regular thing to cancel all orders on the receipt of news from the Cleveland conference that an agreement was virtually in sight.

The selling plan for several days has been to fill orders the moment they were given. Most jobbers have kept in telephone connection with the mines and were able to furnish car numbers often within an hour or two after the order was received, for it was known that the coal would have to be sold again if there were reports of an agreement between the operators and the miners.

Bituminous coal has advanced anywhere up to $1 over regular prices, which are $1.60 for Pittsburg three-quarters, $1.50 for mine-run and $1.25 for slack, with Allegheny Valley running about as high. Coke has not advanced more than 75c., being regularly $4.25 for best Connellsville foundry. All will be back to former prices at once if mining is continued.

The anthracite trade has been suspended, according to the reports of shipping agents, who say that they expect no further supplies now. They are inclined to believe that the suspension is to be short, for the supply is by no means equal to the bituminous. Not a ton has been received here for lake shipment and none can be spared now. A little will go West by rail for awhile, but if the suspension should last till June 14, as it did in 1902, there will be much distress the coming winter in isolated sections.

Cleveland, Ohio

The market at this time is practically at a standstill. People who have coal on track and *en route* are laying low for the final settlement, in anticipation of a suspension, which is expected to be from three to four weeks.

There is considerable high-priced coal *en route* from the mines to Michigan, and the shippers' hope is that there will be a suspension. It is feared that with the great amount of coal on track and *en route*, and because of the fact that the larger manufacturers and railroads have made preparations for a strike, with at least from 30 to 60 days' supply on hand, prices will slump heavily unless the suspension occurs.

Columbus, Ohio

Great activity characterized the coal trade in Ohio during the past week as nearly every one connected with the industry believes that a suspension is bound to come and every effort was made to get in the clear. But nevertheless a softening in prices resulted from the abnormally high quotations of the previous week and not many prices of $2 were paid for steam grades.

It is generally believed that a suspension of from three weeks to a month will have the effect of cleaning up the trade in good shape. It is also believed that a short suspension will not cause any great hardship to any one, but operators do not want the good market to get away from them at this time and for that reason agreed to the small advance in the mining scale which has been tentatively accepted by the miners. The new scale provides for an advance of 5 per cent. for lump, 3c. per ton for all other grades

and 5.26 per cent. in the wages of day men.

The strongest point in the market has been the small sizes which are in demand in every quarter. The mechanical stokers, which are used pretty generally, require the small sizes and thus the strongest grades were nut, pea, slack and coarse slack. Mine-run is also in good demand and prices on grades between mine-run and the small sizes are about the same.

Preparations are being made for an active lake season as reports show that little coal will be carried over on the docks in the Northwest. The indications are good that navigation cannot be resumed as early as usual the coming season; some all-rail shipments will be made to the upper lake region.

There is little demand for domestic grades and the season in that trade is about over. Considerable domestic lump is tied up in the transportation congestion and this will cause a surplus at many points.

Prices prevailing in Ohio fields are:

Hocking Valley	
Domestic lump	$1.75
3-in.	1.65
Mine-run	1.50
Nut	1.50
Nut, pea and slack	1.40
Coarse slack	1.35
Pittsburg No. 8	
3-in.	$1.70
Mine-run	1.70
Slack	1.65
Pomeroy Bend	
Domestic lump	$2.00
3-in.	1.75
Mine-run	1.75
Nut, pea and slack	1.70
Coarse slack	1.65
Kanawha	
Domestic lump	$1.75
3-in.	1.60
Mine-run	1.60
Slack	1.50

Louisville, Ky.

As a precaution, in the event of a strike of the coal miners, the Illinois Central Coal Co. has purchased thousands of tons of coal which is being stored in the yards at Paducah, for use if the supply runs short.

Coal which can be utilized for steam purposes is in such great demand at present that Kentucky operators are overwhelmed with orders for it. This demand caused the price to jump from $1 to $1.25 a ton in the last few days. Dealers say that, due to the prospective labor trouble, last month broke all coal records in Kentucky. Not only the larger manufacturing concerns and the railroads, but dealers and smaller consumers have been stocking up. While steam coal, is in particularly heavy demand, all kinds of coal are wanted.

Charleston, W. Va.

Except for the observance of Mitchell Day, no time has been lost in the districts along the Chesapeake & Ohio, the Virginian and the Kanawha & Michigan roads and their branches. Along these lines in West Virginia there are about 31,000 miners, out of the 69,000 in the entire state; except for a few thousand in the northwestern portion of the state, practically all the men that would be affected by a strike are in the Kanawha district. Last Saturday the indications were that some of the locals would not respect the instructions of the union officials to remain at work until all differences were settled. When many of the mines did not operate on Monday, further belief was lent to the rumor that some of the men in the Kanawha district were out, but later developments showed that the men were at work and would respect the instructions of the union officials. Of the 31,000 men in this section of the state, only between 9000 and 10,000 or 11,000 at the most would be affected by a strike.

The car supply last week was poorer than the week before. This situation is to be relieved, however, before the end of the present week, by an arrangement between the Chesapeake & Ohio and the Ohio Central, whereby a thousand cars will be sent over to the C. & O., in addition to five engines; in fact, the engines are already in the Kanawha field. While these cars will mean less than a day's allotment for the Kanawha district alone, it will, nevertheless, mean a considerable help to the present car situation. The allotment for the two districts takes about 2000 cars a day, but with only enough cars to run two and one-half or three days a week, the addition of a thousand more from another road will assist greatly in relieving the situation. A large number of cars are expected from other lines, and if these expectations are realized, there will be enough in the two districts to keep the mines running six days a week.

Hampton Roads, Va.

With vessels at Hampton Roads demanding approximately 300,000 tons of coal, a good idea can be obtained of the activity at this port. By actual count there are at the Virginian Railway Terminal and off Sewalls Point 11 steamers and 7 schooners and barges; at the Norfolk & Western R.R. piers and off Lamberts Point 8 steamers, 14 schooners and 10 barges; at the Chesapeake & Ohio Ry. piers at Newport News 26 steamers and 11 schooners and barges.

It is obvious that several of these vessels will be delayed some days, as the mines have only been receiving about a 50 per cent. car supply on an average since the first of March. Almost daily one or more steamers take a cargo of coal for foreign shipment from this port; the British steamers "Weardale" for Montevidio, Uruguay, and the "Llanwern" for Madeira cleared recently with cargoes of steam coal. Earlier in the week the British steamer "Leitrim" sailed for Montevidio, making two cargoes for that port during the past week.

The demand for coal here is prodigious, although the greater portion of the output has been loaded to tidewater. The heavy rains west of this city during the past week have caused considerable trouble; some six washouts have been reported on the Virginian R.R. alone, and, although repairs will be rushed, they probably will consume two or three days at least.

The bids for furnishing the Panama R.R. with coal, in which shippers through this port are vitally interested, were opened in New York last Friday, but up to the present writing no award has been made. The bids this year on New River-Pocahontas smokeless coal average 30c. a ton higher than last year and 50c. a ton higher than two years ago.

Indianapolis

The anticipated failure of the coal supply, due to the impending strike became evident in Indianapolis and throughout the state recently, when the larger coal dealers received notice from the railroad companies that they had begun to confiscate coal shipped over their lines. The coal dealers and large consumers say that this means they will be forced to face the expected coal famine with the supply that has been stored in the last few weeks. Several of the railroads deny that such a notice had been issued, but the dealers say the best evidence is the notification at hand and the fact that the railroads are already taking coal by the carload. Several companies operating in Indiana cities are said to be in the midst of a fuel famine.

The situation in Indianapolis is much better. The opinion prevails that Indianapolis is in good shape to stand a siege, notwithstanding its enormous manufacturing interests. The coal movement has been heavier within the last two months in Indianapolis than ever before. For two months or more the railroads, dealers, manufacturing concerns and the public utility corporations have been expecting a strike Apr. 1, and have been getting ready.

Inquiry of local dealers brought out the information that the retail coal yards are well supplied. The price of steam coal that jumped to $2.50 a ton last week when coal of all grades sold to the highest bidder, is now selling at $1.50. Men who keep an eye on the coal situation expect important developments within a few days, but do not believe the situation is as serious as some would have it appear.

Chicago

There has been a drop ranging between 25 and 35c. per ton in the price of coal

in the Chicago market; declines of 50c. a ton have been recorded.

The chief cause is said to be speculation among middlemen, and the large amount of delayed coal which has arrived. A considerable amount of anthracite has reached Chicago and been stored by dealers closely associated with the producers. Producers of furnace and foundry coke report a strong demand for their product. There has been a great deal of contracting for smokeless mine-run; in the majority of instances the price is $1.10 and $1.25 before and after the first of August, respectively.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.50@2.75
Steam lump	2.50@2.75
Screenings	2.50@2.75
Springfield:	
Domestic lump	$2.75@2.82
Steam lump	2.50@2.75
Mine-run	2.50@2.75
Screenings	2.50@2.75
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.50@2.75
Mine-run	2.50@2.75
Screenings	2.50@2.75
Pocahontas and New River:	
Mine-run	$4.25@4.50
Lump and egg	4.25@4.50

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct nut, $4.75; gas-house, $5.

Minneapolis—St. Paul

Coal men in the Twin Cities look for two or three weeks more of inactivity in coal circles, even though difficulties have been practically fixed up with the miners in the bituminous fields. Local newspapers have been giving considerable attention and space to the prospect of a suspension in mining operations which has stirred up the steam market, and manufacturing plants have been buying heavily during the past week.

The dealer in the country has not been in the market for the past month and he will not be buying any stocks until along during the summer months. Coal that was shipped to them a month or two ago has been coming in, but as a whole their stocks are generally low. Tax assessors in the Northwest seem to have the same opinion as elsewhere that coal dealers are legitimate prey against whom assessments should be put up to the limit. This condition always results in the dealer trying to reduce his stocks to the minimum along about May 1.

The announcement Saturday morning of the settlement between the bituminous miners and operators has had a tendency to make a slight drop in prices, although coal on the market is very scarce and very little is coming into the Twin Cities unsold.

Dockmen say they are very busy cleaning up and repairing the docks and will be putting in repairs and improvements from now on until the lakes open up.

St. Louis, Mo.

With the suspension on in Illinois there is practically no market, inasmuch as there is no demand at this time. The market was glutted the latter part of last week with several hundred cars of Kentucky coal at East St. Louis, which proved valuable to those who had failed to lay in a supply. Kentucky mine-run coal sold for 40c. at the mines, with a $1.10 rate to East St. Louis, and something like 150 to 200 cars were sacrificed at this price.

What little market was left was pretty well broken up Saturday, when it was generally known that the operators and miners had reached an agreement for Illinois, Indiana and Ohio. The coal that was mined Saturday was kept on track, and in one or two instances certain mines in the Illinois field worked Sunday; this coal is being held on track and will be gradually worked off at any price the operators may consider good.

Indications are that the suspension here will last about 30 days or six weeks. This, however, will depend upon whether certain operators in Illinois, who, it is thought, may start up right after Apr. 1, will agree to stay out. It is understood that if one whistle blows for work, other mines in the southern Illinois field will start up the next day, regardless of whether it is May 2 or Apr. 2.

There is no anthracite coming in, but a fairly good tonnage of smokeless is arriving on orders previously placed. Coke is in good demand at $4.75@$5, St. Louis. The market opened up on coal held at the mines about as follows:

Franklin County	
Lump and egg	$1.85@2.00
No. 1 nut	1.85@2.00
No. 2 nut	1.60@1.75
2-in. screenings	1.30@1.40
Carterville	
Lump and egg	$1.75@1.85
No. 1 nut	1.50@1.60
Screenings	1.30@1.40
Mine-run	1.25@1.35
Standard	
2-in. lump	$1.50@1.60
Screenings	1.20@1.30
Mt. Olive	
6-in. lump	$1.75@1.85

Portland, Ore.

There is absolutely no change in the coal-market conditions here since last report, prices being unchanged and the demand light on account of favorable weather conditions. While the East and Middle West have had cold weather with snow, according to reports received here, Oregon is having ideal spring weather. The chief topic of discussion now in commercial circles is the coming opening of the Panama Canal and ship tolls, the Pacific Coast standing solidly for free tolls to American bottoms in coastwise traffic.

San Francisco

Deliveries for the past week have been light, nothing coming in from Australia. Shipments from British Columbia aggregated 8200 tons; receipts from the Rocky Mountain district were normal and it is safe to say that more coal was put out to the consumer than was received.

At the present time the wholesalers are carrying about 30,000 tons of Australian. On the other hand, there are no arrivals of this coal due in the near future with the exception of one steamer with a carrying capacity of 5000 tons.

There has been no change in rates and present prices are as follows:

Wellington, British Columbia	$ 8.00
Pelam Main, Australia	8.00
Rocky Mountains	8.50
Cumberland	12.50
Anthracite, Penn	15.00

Financial Notes

The Pittsburgh Coal Co. declared regular quarterly dividend of 1¼% on preferred stock, payable Apr. 25 to stock of record Apr. 13.

The Delaware, Lackawanna & Western Coal Co. has declared the regular quarterly dividend of 2½%, payable Apr. 15 to holders of record Apr. 1.

The directors of the Island Creek Coal Co. have declared the regular quarterly dividend of $1.50 per share upon the preferred capital stock of this company, payable Apr. 1, 1912, to stockholders of record at the close of business Mar. 23, 1912.

The board of directors of the Reading Co. has declared from the net earnings a quarterly dividend of 1% upon the second preferred stock of the company, to be paid on Apr. 11, 1912, to stockholders of record at the close of business on Mar. 26, 1912.

On Jan. 1 bank deposits in the eight districts of Pennsylvania, which will be most seriously affected by the anthracite strike on Apr. 1, amounted to $118,069,951. Eight years earlier, or on Jan. 1, 1904, deposits in banks of the same districts totaled but $66,419,001.

Last February the Reading Coal & Iron Co. realized $4,031,000 from the sale of anthracite, while in February, 1911, its sales amounted to only $2,306,000. The company has not been receiving any higher prices this year, although many of the retailers have been getting an advance of $1 a ton, but with the larger output the Reading has evidently been able to reduce its cost of mining per ton. Last year the February operations resulted in a deficit of $25,000, but this year's sales showed a profit of $287,000. Total sales for the eight months of the fiscal year have amounted to $26,097,000 as compared with $22,490,000 in the corresponding part of last year. The net earnings this year have been $1,014,000 as against $287,000 last year.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Berg-Hüttenmänn. Rdsch. = Berg- und Hüttenmännische Rundschau.
Bull. Am. Inst. Min. Engin. = Bulletin American Institute of Mining Engineers.
Bull. Assoc. Ing. Liège = Bulletin de l'Association des Ingenieurs sortis de l'Ecole de Liège.
Bull. Ass. Sucr. = Bulletin de l'Association des Chimistes de Sucrerie et de Distillerie de France et des Colonies.
Canad. Engin. = Canadian Engineer.
Chem. Engin. = Chemical Engineer.
Colliery Guard. = Colliery Guardian.
Compt. Rendus Acad. Sciences = Comptes Rendus de l'Académie des Sciences.
El. Engineering = Electrical Engineering.
El. Jl. = Electrical Journal.
Engin. Contract. = Engineering Contractor.
Engin. Min. Jl. = Engineering and Mining Journal.
Engin. News = Engineering News.
Geol. Mag. = Geological Magazine.
Giess.-Ztg. = Giesserei-Zeitung.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
JB. Berg-Hüttenw. Sachsen = Jahrbuch für das Berg- und Hüttenwesen im Königreich Sachsen.
Jern. Kont. = Jern Kontorets Annaler.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Gasbeleuchtung = Schilling's Journal für Gasbeleuchtung und Wasserversorgung.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. South Afr. Inst. Engin. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Mines Minerals = Mines and Minerals.
Min. Scient. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mitt. Ver. Moorkultur = Mitteilungen des Vereins zur Förderung der Moorkultur im Deutschen Reich.
Mon. Ind. Gaz = Moniteur de l'Industrie du Gas de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Tonind.-Zeitung = Oesterreichische Tonindustrie-Zeitung.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift fur Berg. und Hüttenwesen.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Rock Prod. = Rock Products.
S. Afric. Min. Jl. = South African Mining Journal.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Techn. Rdsch. = Technische Rundschau.
Tiefbohrwes. = Tiefbohrwesen.
Transact. Inst. Mining Eng. = Transactions of the Institution of Mining Engineers.
Transact. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. El. Machb. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

An Elementary Text Book of Coal Mining. R. Peel, 15th Edtn., Cr., 8vo., 7¼x4½, 386 pp., Blackie, London, 75c.

Mining Mathematics. S. N. Forrest, Cr., 8vo., 7½x4¾, 312 pp., E. Arnold, London, $1.12 net.

The World's Minerals. L. Ja. Spencer, 8vo., 11+272, 40 illus., 21 diag., N. Y., Stokes, 1911, $2.

Potts' Mining Register and Directory for the Coal and Ironstone Mines of Great Britain and Ireland. 1911, 8vo., 7½x4¾, 470 pp., Railway Gaz., London, 85c. net.

The Finance of a Mine. M. H. Burnham, Min. Mag., Vol. 5, 1911, 6, pp. 444-8, 6 fig., 1 tab. (The growing importance of engineers in dealing with the financial side of mining.)

The Price of Coal. H. Brighthouse, 18mo., Gowans & G., London, swd., 12c. net.

Mining Operations in General. (Le règlement général des mines.) Rev. Noire, Vol. 14, 1911, 367, pp. 332-35; 368, pp. 356-61; 369, pp. 387-88; 370, pp. 415-17; 371, pp. 437-40. (Installations at the pit head and adits, staple shafts; haulage inclines; haulage in roads; engines and ropes; work at the face; ventilation; special precautions against dust; lighting; explosives; pit fires and sudden outbursts of dangerous gases; use of electricity in ground operations; hygiene in the workings; plans and records; various arrangements.)

Modern Coal Mining Plant of Concrete Construction. Cement Engin. News, Vol. 23, 1911, 9, pp. 301-3, 5 fig. (The construction of the Bunsen Coal Co.'s Universal Mines, Clinton, Ind.)

Report of Mission to England and Germany with Reference to the Distribution of Energy in Colliery Districts. F. Leprince-Ringuet. (Rapport de mission en Angleterre et en Allemagne sur la distribution de l'énergie dans les regions houllières.) Ann. Mines., Vol. XX, 1911, 10, pp. 245-355, 24 fig., 5 illus., 3 plates. (State of the question. Distribution in Durham, Northumberland, Westphalia, Rhenish Prussia, and the Saar district.)

Progress in the Coal and Iron Industry in India. Ol. Favarney. (Progrès des Industries du charbon et du fer dans l'Inde.) Rev. Industrielle, Vol. 42, 1911, 50, pp. 494.

Situation of the Mining and Metallurgical Industry of Belgium in 1910. Jos. Libert. (Situation de l'industrie minière et métallurgique de la Belgique en 1910.) Circ. 4316. Comité Central Houillères France, pp. 1-12.

Extensions in Rhenish-Westphalian Coal Mining. (Die Betriebserweiterung im Rheinisch-Westphaelischen Steinkohlenbergbau.) Ernst Juengst, Glückauf, 1911, 51, pp. 1996-2001; 52, pp. 2037-47, 2 tab.

Binley Colliery. Iron Coal Trade Rev., Vol. 83, 1911, 2282, pp. 839-41, 9 fig. (Plan and equipment of a South Staffordshire Colliery.)

II—GEOLOGY

Experimental Geology (2nd series), Part 2. Application of the experimental method to the study of the phenomena of sedimentation; Part 3, Application of the experimental method to the study of orogenic phenomena (formation of mountains.) R. Lecointre. (La Géologie experimentale (2 serie), 2, partie, Application de la méthode expérimentale à l'étude des phénomènes de sédementation; 3, partie, Application de la méthode expérimentale à l'étude des phénomènes orogéniques (formation des chaines de montagnes.) 8vo., 28 pp, Paris, G. Vitry, 1911.

Relation between the Serial Order of Seams and Quality of Coal in the Ostrau-Karwin District. (Beziehungen zwischen Floezfolge und Eigenschaften der Kohle im Ostrau-Karwiner Reviere.) W. Petraschek, Montan. Rdsch., 1911, 11, pp. 482-92, 3 fig. (Gas content and caking power of the coal are important for the identification of the seams. Changes in the properties of the coal proceed in accordance with certain laws and stand in simple relation to the succession of seams.)

The Coals of the East. (Les charbons de l'orient.) Circ., 4329. Comité Central Houillères France, pp. 1-12.

III—MINING TECHNOLOGY

Coal Cutting Machinery. W. B. Shaw, Iron Coal Trades Rev., Vol. 83, 1911, 2283, pp. 879-82, 19 fig. (Paper read before Manchester Assoc. Engin.)

Coal Cutting Machinery. W. B. Shaw, S. Afric. Engin., Vol. 16, 1911, 6, pp. 109-12, 6 fig. (Advantages and difficulties of the use of machines.)

Coal Cutting Machinery. W. B. Shaw, Electrician, Vol. 68, 1911, 11, pp. 420-2. (Various types of machines in use, considered and compared.)

Jeffrey Short Wall Coal Cutter. Brit. Columb. Min. Engin. Rec., Vol. 16, 1911, 11, pp. 331-3, 3 fig. (A new room-and-pillar machine which cuts across the face of the coal.)

Methods of Driving by Gas Engines for Collieries. A. E. L. Chorlton, Iron Coal Trade Rev., Vol. 83, 1911, 2285, pp. 961-4, 4 fig.

Advance in Air Compression. Mines Minerals, Vol. 32, 1912, 6, pp. 339-40, 3 fig. (Single-cylinder, two-stage, electric driven air compressor, with Rogler-Hoerbiger valve.)

Small Bar Mill with Mechanical Cooling Bed. J. Schmitz, Iron Coal Trades Rev., Vol. 83, 1911, 2280, pp. 770-1, 4 fig.; 2282, pp. 844-5, 12 fig. (A cooling bed 400 ft. long.)

On Stone Drills. (Etwas ueber Steinbohrer.) Steinbruch, Vol. 6, 1911, 31, pp. 368-69.

IV—WORKING OF MINERALS

Working Steep, Thin and Gassy Coal Seams. (Abbausteilgelagerter, wenig maechtiger und schlagwetterreicher Steinkohlenfloetzel.) Kohle Erz., 1912, 2, pp. 39-42, 1 fig. (Height of pillars in pillar and subsidence working.)

The Rill System of Stoping. J. B. Wilson, Engin. Min. Jl., Vol. 92, 1911, 21, pp. 1000-2, 2 fig. (A Western Australian method of stoping in narrow deposits.)

Mine Working in Prussia during 1910. (Der Bergwerksbetrieb im Preuss. Staate während des Jahres 1910.) Z. Bergwes. Preuss., 1911, 2, Stat. Lieferung, pp. 71-139.

V—BORING, SHAFT SINKING AND TUNNELING

Novelties in Drills. (Neuerungen in der Bohrtechnik.) Bauwesen, 1911, 21, pp. 159-60. (Hammer Drills by Kummer, Dresden; Driving head by Frankignoul, Liège; New Percussion Drills.)

Deep-boring Hand-Book. Vol. 4. Rope-Drilling (Drilling Wells.) Revised by B. Baak. (Handbuch der Tiefbohrkunde, 4 Bd., Das Seilbohrsystem Brunnenbohren.) Neu bearb. v. B. Baak, Th. Tecklenburg, Lex. 8vo., VII, 132, pp. 54, illus., 27 tab., Berlin, W. & S. Loewenthal, 1911, S3.35.

Deep Boring. (Das Tiefbohrwesen.) Hans Bansen. (Unter Mitwirkung von A. Gerke and L. Herwegen bearb.) 8vo., XX, 517, pp. 688 illus., Berlin, J. Springer, 1912, S3.80.

The Action and Control of Differently Constituted Coal Roofs. W. H. Hepplewhite, Iron Coal Trade Rev., Vol. 83, 1911, 2285, pp. 970-1.

The Freezing Method of Sinking. W. B. Wilson, Colliery Guard, Vol. 102, 1911, 2659, pp. 1181.

Impregnating the Coal Face. (Stosstraenkeverfahren.) Glückauf, 1911, 46, pp. 1908. (Experiments at the Consolidation 3-4 pit. Success attained in only a few instances. Small economic advantage.)

VI—BLASTING, EXPLOSIVES

A Contribution to the Examination of Dynamite Glycerine. (Ein Beitrag zur Beurtheilung des Dynamitglycerins.) F. Hofwimmer, Chemiker-Ztg., Vol. 36, pp. 41-2, 1 fig. (Estimation of glycerine (glycerolin) by nitration and determination of the nitroglycerine obtained, in a specially constructed apparatus.)

Experiments and Alterations of the Charge Limits of Explosives in Accordance with the Sectional Area of the Experimental Gallery. (Untersuchungen ueber die Veraenderungen der Grenzladungen von Sprengstoffen mit den Querschnitten der Versuchsstrecken.) V. Watteyne and J. Bolle, Z. Schiesswesen, Vol. 6, 1911, 17, pp. 321-23; 18, pp. 344-48; 19, pp. 371-2, 2 fig. (Various causes influencing the charge limit. Experimental determination of the charges igniting firedamp and coal dust in galleries ¼, 1 and 2 sq.m. sectional area.)

Contribution to the Knowledge of Explosives. A. Rzehulka. (Zur Kenntnis d. Spengstoffe.) Montan. Rdsch., 1911, 22, pp. 1056-61; 23, pp. 1110-3; 24, pp. 1154-6. (Discussion of the most important explosives and their valuation in practice.)

VII—TIMBERING, PACKING, ETC.

Various Kinds of Pipes Used in Hydraulic Goaf Packing. (Die verschiedenartigen Spuelleitungen im Versatzbetriebe.) Lueck, Ungar. Montan. Ind., 1911, 23, pp. 3-5. (Unlined and wood-lined pipes.)

Timber Used in Mining Operations. H. R. MacMillan, Canad. Min. Jl., Vol. 32, 1911, 21, pp. 685-91. (The Canadian supply of round and sawed timber.)

Mining without Timber. R. B. Brinsmade, 8vo., 309 pp., illus. N. Y., McGraw-Hill, 1911, S3.

Brattices of Wire and Brattice Cloth in Goaf Packing. (Steckenverzug im Bergversatz mit Draht und Versatzleinen.) DC. Glückauf, 1911, 42, pp. 1656-7, 5 fig. (Description of the conditions at the Lothringen colliery, Gerthe.)

VIII—WINDING AND HAULAGE

On Pneumatic Mine-Locomotives. Franz Koneczny. (Ueber Druckluftlokomotiven.) Montan. Rdsch., 1911, 20, pp. 955-7; 23, pp. 1113-5. (Types built by Rud. Meyer, the H. K. Porter Co. in Pittsburg, and L. Schwartzkopff in Berlin.)

Weight and Equipment of Mine Locomotives. G. Bright, El. Jl., Vol. 8, 1911, 11, pp. 986-98, 2 fig., 2 tab. (Locomotives with motor equipment.)

Economical Winding from Great Depths. (Wirtschaftliche Schachtfoerderung aus grossen Teufen.) Moldenhauer, Glückauf, 1911, 51, pp. 1981-92, 37 fig.

Mechanical Haulage in Mines. (Maschinelle Streckenfoerderung.) Ernst Blau, Kohle Erz., 1911, 51, pp. 1289-98, 52, pp. 1313-20, 7 illus., 6 fig. (Chain and rope haulage.)

Electric Main-Shaft Hauling Machines. Alfred Strauss. (Elektrisch betriebene Hauptschacht-Foerdermaschinen.) Bayer, Ind. u. Gewerbebl., Vol. 97, 47, pp. 461-5, 5 illus.

Modern Hauling Problems. R. W. Hutchinson, Cassier's Mag., Vol. 40, 6, pp. 556-60.

The Whitmore Brake and Overwind Prevention Gear. Colliery Guard, Vol. 102, 1911, 2658, pp. 1125, 1 double plate.

IX—SIGNALING

Pit Shaft Signaling. E. E. Beardsmore, Iron Coal Trades Rev., Vol. 83, 1911, 2283, pp. 899, 4 fig. (Read before Assoc. Min. El. Engin.)

X—LIGHTING

Lighting in Fiery Mines. (Die Beleuchtung in den Schlag. wettergruben.) Montan. Rdsch., 1911, 24, pp. 1158-9. (The Friemann & Wolff flat-wick lamp.)

Device for Electric Ignition of Mine Safety Lamps. Chavy, Jean, Liévin, Pas de Calais. Marcel, Delage u. Paul Woog, Paris. (Einrichtung zum elektrischen Zuenden von Grubensicherheitslampen.) DRP. 241, 306, 30 Juli, 1909.

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Ventilation and the Prevention of Dust on the Rand. H. S. Martin, S. Africa Min. Jl., Vol. 9, 1911, 453, pp. 333-4. (The inverted cone system.)

Reversing the Air Current in Coal Mines. F. N. Siddall, Iron Coal Trades Rev., Vol. 83, 1911, 2885, pp. 980-1. (Read to Nat. Assoc. Colliery Managers, South Midland.)

Some Features of the New Mining Regulations. S. Afric. Min. Jl., Vol. 9, 1911, 455, pp. 409. (Ventilation, water and underground supervision.)

XII—MINE GASES, TESTING

The Escape of Gas from Coal. Colliery Guardian, Vol. 102, 1911, 2657, pp. 10,072.

The H. W. C. Apparatus for Instruction and Research in Gas Testing. Colliery Guard., Vol. 102, 2659, pp. 1177-8, 2 fig.

XIII—COAL DUST

Experiments on Liquid Mixtures for Laying Coal Dust. W. M. Thornton, Iron

Coal Trades Rev., Vol. 83, 1911, 2285, pp. 966-7. (Continuation of discussion of paper read before N. Eng. Inst. Min. Mech. Engin.)

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Automatic Watering Valve (Selbsttaetiges Ventil fuer Berieselungszwecke.) Glückauf, 1911, 49, pp. 1927, 1 fig. (The fitting-ball sprinkling valve at Rheinpreussen colliery. Valve opens automatically when the hose pipe is screwed onto main supply pipe, and shuts automatically when pipes are disconnected.)

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Experiments on Liquid Mixtures for Laying Coal Dust. W. M. Thornton, Colliery Guard., Vol. 102, 1911, 2659, pp. 1181-3.

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Accidents in Mines. W. Hanauer. (Die Unfaelle im Bergbau.) Oesterr. Z. Berg-Huettenwes., 1911, 51, pp. 706-7.

Radiations in Explosions of Coal-Gas and Air. W. T. David, 4to., 24 pp., Dulau, London, swd., 25c.

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XVI—RESCUE AND AMBULANCE

Liquid Air Rescue Apparatus at the Makiewka Donety Rescue Station. D. Lewitsky. Compressed Air Mag., Vol. 16, 1911, 12, pp. 6261-4.

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The New Oxygen-Rescue Apparatus Built by the Draegerwerk-Luebeck. (Die neuen Sauerstoff-Rettungsapparate d. Draegerwerks-Luebeck) Ernst Silberstein, Sozial-Techn., 1912, 2, pp. 25-9, 2 fig., 2 illus.

The Tartsch Cycle Track for Rapid Aid in Pit Accidents. (Das Grubenrettungsrad nach W. Tartsch zur raschen Hilfeleistung bei Unglückfällen, Grubenkatstrophen u. a. m. in Bergwerken.) R. Penkert, Kohle Erz., 1911, 52, pp. 1319-24. (Construction of the cycle; tandem for two members of rescue corps. Equipment; two Draeger apparatus, worn by the riders; two pulmotors, each with two reserve oxygen bottles; Hardtmann box bandages.)

Improvements in Rescue Work. (Neuerungen auf dem Gebiete des Grubenrettungswesens.) Eugen Liewehr, Montan. Rdsch., 1912, 1, pp. 11-5, 1 fig. (Chiefly the arrangement of underground shelters.)

XVII—DRAINAGE, PUMPING, ETC.

Turbine Mine Pumps. Mines Minerals, Vol. 32, 1911, 5, pp. 287, 1 fig. (Comparison from experience with ordinary steam pumps.)

Rateau Pumps for New Pumping Plants. (Rateau-Pumpen fuer neuere Wasserhaltungsanlagen.) Ernst Blau, Kohle Erz., 1911, 49, pp. 1241-8; 50, pp. 1265-73, 10 fig.

Device for Unwatering Pits by the Siphon Principle. (Vorrichtung zum Entwaessern von Grubenfeldern nach d. Hebersystem.) J. Salzmann, Braunkohle, Vol. 10, 1912, 41, pp. 650-53, 1 fig. (Description of new process. Length of time required for unwatering. Cost.)

Sealing off Mine Water. E. B. Kirby, Engin. Min. Jl., Vol. 92, 1911, 21, pp. 986-8, 4 fig. (The mud process by which fine material is forced into the crevices. Elaborate machinery required.)

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Mechanical Devices for Quenching and Loading Coal. A. Than, Iron Coal Trades Rev., Vol. 83, 1911, 2280, pp. 763-5, 19 fig. (Translated from "Glückauf.")

A New System of Screening and Loading Coal. Iron Coal Trade Rev., Vol. 83, 1911, 2284, pp. 291-3, 7 fig.

Coal Washing Plant at the Cramlington Colliery. Engineer, Vol. 112, 1911, 2921, pp. 648, 2 fig., 1 plate.

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Taylor Breaker near Scranton, Penn. M. A. Walker, Coal Age, Vol. 1, 1911, 11, pp. 334-6, 1 fig. (A new breaker and washery combined, with electrically operated machinery.)

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Coal Handling Plant at Duluth. Iron Age, Vol. 88, 1911, 23, pp. 1240-3, 3 fig. (Traveling bridges take coal from barges at the rate of 15,000 tons an hour, mechanical screening apparatus, delivery to million-ton storage yard.)

XXV—SANITATION, DISEASES

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